A STUDY OF FACTORS DETERMINING OUTCOME OF ACUTE RENAL FAILURE PATIENTS REQUIRING HEMODIALYSIS

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CERTIFICATE

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INTRODUCTION

INTRODUCTION

Acute renal failure is broadly defined as "an abrupt and sustained decrease in kidney function". Clinical signs include a rapidly decreasing glomerular filtration rate (GFR), resulting in disturbances in electrolyte- and acid-base balance, derangement of extra cellular fluid volume, retention of nitrogenous waste products and often a decreased urine output[1].

The epidemiology of acute renal failure (ARF) has changed over the years. This may partly be caused by a change in patient characteristics, but more importantly, by a change in definition of the disease. Recent research emphasizes the clinical importance of less severe impairment of kidney function, resulting in the broader term acute kidney injury (AKI). It needs to be stressed: acute kidney injury is a common clinical problem in critically ill patients and is associated with significant morbidity and a high mortality rate[2]. Historically, some researchers have argued that patients die *with* AKI - not *of* AKI – arguing that it merely denotes an expression of illness severity; but now strong evidence backs up the notion that AKI has an independent impact on outcome, even after all other variables affecting outcome has been corrected for[3,4,5,6].

The confusion on how best to assess kidney function include what markers that best reflect it, and what values of those markers discriminate normal from abnormal kidney function. To bring clarity to the field, the Acute Dialysis Quality Initiative (ADQI) devised the RIFLE classification[7]. The acronym RIFLE defines three grades of increasing severity of AKI (risk, injury, and failure, respectively, R, I, and F) and two outcome variables (loss and end-stage kidney disease, respectively, L and E).

More recently, the Acute Kidney Injury Network (AKIN) group, an international collaboration of nephrologists and intensivists, have proposed refinements to the RIFLE criteria[8]. Specifically, the AKIN group sought to increase the sensitivity of the RIFLE

criteria by recommending that a smaller increase in serum creatinine (≥0.3 mg/dl) be used as a threshold to define the presence of AKI and identify patients with Stage 1 AKI (analogous to RIFLE-Risk) (Table 1). This modification should be seen in the light of recent findings, demonstrating that small increases in serum creatinine are associated with increased mortality[9,10]. Second, a time constraint of 48 h for the diagnosis of AKI was proposed. Finally, any patients receiving renal replacement therapy were to now be classified as Stage 3 AKI (RIFLE-Failure).

A study by Bagshaw and co-workers evaluated the AKIN and RIFLE criteria side by side, in a multicenter database study of 1,20,123 critically ill patients. They found that, compared to the RIFLE criteria, the newly proposed AKIN criteria do not materially improve the sensitivity, robustness or predictive ability of the definition and classification of AKI in the first 24 h after admission to the intensive care unit (ICU), and conclude by writing: "There would appear to be no justification at present for the introduction of a modified definition and classification system for AKI." A comparison of the RIFLE and AKIN definition and classification schemes for AKI is shown in TABLE 1

Table 1. A comparison of the RIFLE and AKIN definition and classification schemes for AKI

RIFLE Category	Serum creatinine criteria	UO criteria
(A)The acute dialysis quality initiative (ADQI) criteria for the definition and classification of AKI (i.e. RIFLE criteria)		
Risk	Increase in serum creatinine≥1.5x baseline or decrease in GFR ≥ 25%	< 0.5mL/kg/h ≥ 6h
Injury	Increase in serum creatinine≥ 2.0x baseline or decrease in GFR ≥50%	< 0.5mL/kg/h ≥ 12h
Failure	Increase in serum creatinine≥ 3.0x baseline or decrease in GFR ≥75% or an absolute serum creatinine ≥354µmol/L with an acute rise of at least 44µmol/L	< 0.3mL/kg/h ≥ 24h or anuria ≥ 12h
AKIN criteria	Serum creatinine criteria	UO criteria
(B) The proposed Acute Kidney Injury Network (AKIN) criteria for the definition and classification of AKI		
Stage 1	Increase in serum creatinine≥ *26.2*µmol/ L or increase to ≥ 150 - 199% (1.5 – 1.9 fold) from baseline	< 0.5mL/kg/h ≥ 6h
Stage 2	Increase in serum creatinine to 200 - 299% (> 2 – 2.9 fold) from baseline	< 0.5mL/kg/h ≥ 12h
Stage 3	Increase in serum creatinine to ≥ *300%* (≥ *3* - fold) from baseline or serum creatinine ≥ *354*µmol/ L with an acute rise of at least 44µmol/ L or initiation of RRT	< 0.3mL/kg/h ≥ 24h or anuria ≥ 12h

REVIEW OF LITERATURE

REVIEW OF LITERATURE

ARF is a devastating illness that is associated with a high risk of mortality. Despite several decades of clinical experience with acute renal failure, the advent of newer antibiotics, vastly improved dialytic techniques, an impressive growth in the availability of vasoactive drugs and aggressive nutritional support, the mortality rate of ARF has shown only a modest improvement over the last few decades. Bisenbach et al [11] in an analysis of 710 cases over a period of 15 years, observed a reduction in the overall mortality from 70 % in 1975-79 to 48 % in 1985-89. However, Forts et al [12] noted a mortality of 46 % which did not change significantly over a period of 12 years.

The unchanged mortality in acute renal failure has been attributed to many reasons. First there has been a change in the population susceptible to ARF[12] Previously, the patients were predominantly young quite often from the armed forces or women of fertile age, whereas now it is more frequent among older patients [11]. Secondly, there have been new development in medical techniques and aggressive interventions which can maintain people alive, who would previously have died before having time to present with ARF [13]. The appearance of multiple organ system failure has contributed to a situation in which life can be prolonged and maintained indefinitely by artificial means in a patient who will inexorably die after lengthy suffering.

The most precise way of establishing the vital prognosis of an entity is by determination of its mortality rate. Acute renal failure continues to have a high mortality and it varies according to the setting in which ARF developed. In a general setting, the mortality is upto the tune of 40-50 %, whereas, it reaches up to 90% in the ICU setting [17, 24] The fact that mortality in ARF is very high has interested many authors to conduct studies of factors predicting the outcome in ARF.

Numerous studies have been conducted both prospectively and retrospectively, and various prognostic factors have been proposed to predict the outcome in ARF patients. Some of the studies have been performed in specific situations like ARF following aortic aneurysm surgery, [14] post traumatic ARF [15] and ARF in the ICU setting. [16, 17]

There is considerable variability in study designs, ranging from large [25] to small retrospective series[26]. Inclusion criteria vary, ranging from mild increased in creatinine to only dialysis treated patients [21]. Still fewer studies[18,19,20] focus, even in part, on the epidemiology of ARF requiring dialysis within the ICU (severe acute renal failure of critical illness). The need for both dialysis and ICU care defines a specific group of critically ill patients who may have a particularly poor prognosis[18,21,22] and who consume vast amounts of resources[23]. Information on the overall incidence, style of management, and patient outcome would be useful in assessing current therapeutic approaches, research and resource allocation, and future therapies.

Another feature of modern studies is that factors found non contributory on univariate analysis can be contributory in multivariate analysis and conversely, factors predictive on univariate analysis may be redundant on multivariate analysis.

Denominators of survival in ARF patients

Multiple denominators of survival in patients with ARF have been proposed but none of them has been generally accepted or has not been challenged by others. Little prospective information on independent predictors identified by appropriate multivariate analysis is available. These proposed factors can be classified in few groups.

I. Patients characteristics

(a) Cause of ARF

The cause of ARF will serve as a strong predictor of survival. There is abundant evidence that the causes of ARF affecting younger patients like war victims and obstetric causes carrying excellent prognosis are decreasing. At the same time, causes of ARF with poor prognosis like hypotension and sepsis have increased in the elderly people.[21] Turney et al [25] in a study of 1347 patients with severe acute renal failure treated at a single centre between 1956 and 1988, observed that there was decline in obstetric and traumatic causes, both of which carried an excellent prognosis and there was an increase in the number of elderly patients with complicated medical and surgical conditions. A similar observations was also made by Beaman et al [27] and Chugh et at [28].

Among medical causes, toxic agents (contrast, aminoglycosides and other drugs) have increased and appear to have good prognosis with survival rate of upto 80%. Medical causes other than toxic renal damage (sepsis and heart disease) have poorer survival with survival rate of 45%[29].

In a study of prognostic factors in acute renal failure due to sepsis, Neveu et al [30] observed that patients with septic ARF were older, had higher organ failure scores at inclusion, had a higher need for mechanical ventilation, and mortality was higher in these patients when compared to those with non septic ARF. Mortality was influenced by the presence of septic shock or of sepsis syndrome on inclusion. However, a few studies in contrast have failed to show any independent link between sepsis and mortality [28,31,32]

Series examining surgical patients show survival rates between 19 and 47 % [31,14]. Discriminant analyses have given conflicting results regarding surgery. Cioffi et al [31] identified cardiac and vascular surgery (other than on the abdominal aorta) as predictors of

mortality while Rasmussen et al [33] observed non cardiovascular surgery to be a predictor of mortality.

Improvements in obstetrical care have led to a virtual disappearance of ARF related to pregnancy in the advanced countries. Even in some of the developing countries like India, the incidence of obstetric ARF has shown a decline from 22% (of all ARF) in 1960s to 8% in 1990s [28] . On the other hand, in Ethiopia, septic abortion is the underlying cause of ARF in 52% of all patients [72] and in Argentina and Nigeria, gynecologic and obstetric complications still account for 32% and 25% of cases of ARF respectively [64,65,] . This high incidence is due to the prevalence of unsafe home deliveries and abortions conducted by untrained personnel.

(b) Setting in which ARF develops

In community acquired ARF (CARF) the prognosis usually is excellent. Kaufman et al [34] studied prospectively over 17 months, 100 patients who were admitted to the hospital with acute elevation of serum creatinine. Seventy percent of the patients had prerenal azotemia, 11% has intrinsic acute renal failure, 17% has obstruction and 2% could not be classified. Mortality was lowest (7%) in the group with prerenal azotemia. Volume contraction due to vomiting decreased fluid intake, diarrhea, fever or diuretics was the most common underlying cause. The group with intrinsic ARF had the highest mortality (55%) with drug-induced ARF and infection-related ARF being the common causes. The overall mortality in this study was 15%. In a prospective study done by Feest et al [35] of severe ARF in adults in the community, an overall survival of 54% was noted at two years.

When ARF developed as a nosocomial disease during hospital stay outcome is much less favourable. In a study of risk factors and outcome of hospital acquired ARF[36], the development of hospital acquired ARF was associated with a marked increase in the risk of death- the relative risk being 6.5 and it was associated with marked increase in length of stay.

Jha et al [37] in a study of hospital acquired renal failure observed a mortality rate of 41% and the death was related directly to the renal failure in 14% of these patient. Occurrence of renal failure during maximum therapeutic support at a critical care unit carries a grim prognosis.

C) Severity of renal injury :

The severity of renal injury has an impact on renal recovery after ARF. The need for renal replacement therapy is associated with a poor prognosis. Lohr et al [21] in a study of 126 patients of ARF who received dialysis observed a survival of 25 %. Patients who had systolic blood pressure (SBP) <110 mmHg, assisted ventilation, congestive heart failure, proven or suspected sepsis had higher mortality rates and survival decreased with increasing number of the above mentioned factors. Liano et al [29] in a study of 228 patients observed that need for dialysis was associated with higher mortality as compared to those not requiring it (65% vs.46%). Abreo et al [38] in a study measuring the outcome of 55 consecutive patients requiring haemodialysis (HD), noted an increase in the mortality from 54% to 72%.

Incidentally the need for dialysis is not an objective criterion because the indications to institute haemodialysis may vary considerably between institutions with several units favouring early dialysis therapy when BUN levels of about 50mg/dl. In many instances the severity of renal injury will reflect the severity of underlying disease but this is not necessarily the case as in nephrotoxic ARF of intrinsic renal disease.

Serum creatinine at the time of admission or diagnosis of ARF has lacked predictive value [26]. However, the peak creatinine level has been found to relate to outcome in more than one study [34,39]. This view has also been disputed. Urea levels (either on admission, at time of diagnosis, rate of rise or peak levels) appear to be unhelpful in predicting the outcome.

(d) Urine output

Oliguric ARF is associated with higher mortality than non oliguric ARF. In a study of Rasmussen et al, [33] oliguria and pre-existing heart disease were the most common predictor variables of mortality and was significant at the 0.05 level on univariate analysis. Liano et al[29] in prospective analysis of 228 cases, observed that oliguria was associated with higher mortality (65% vs. 42%) as compared to non oliguric ARF.

(e) Demographic factors

There is no consistency in the literature relating age to increased mortality in ARF. Because of the various age related changes in kidney function such as decrease in glomerular function and concentration ability, disturbances of thirst and fluid balance leading to hypovolemia, the susceptibility of developing ARF is increased in advanced age and a comparatively mild insult will lead to renal shutdown. Advanced age is associated with multiple additional illness such as generalized atherosclerosis, hypertension and diabetes mellitus[40]. Because of these associated factors Several studies have identified age as an adverse prognostic factor in ARF [25, 31]. While others have not found age to be an independent predictor of mortality [41,29,34,20]. In a hospital based prospective study on treatment related ARF in the elderly Kohli et al [42] observed that mortality was significantly higher in elderly patients with ARF than those without it.

(f) Organ dysfunction

The mortality of patients with ARF increases with the number of failed organ systems both in ICU and non ICU settings [43].

Presence of multiorgan failure was associated with increasing mortality in a study by Jha et al [37]. Chertow et al [18] observed that the mortality of ARF in patients on a ventilator is about 80% and mortality increased with increasing number of failed non respiratory organs.

Central nervous system dysfunction has also been associated with poor prognosis[29]. GI bleeding was not associated with poor prognosis in earlier studies [41,20,32].

Shock has often been associated with a poor prognosis and was found to be an independent predictor of mortality[21,29,20]. Hypotension was found to be an independent predictor of mortality using multivariate analysis [21,29,45,20].

(g) Comorbidities

Co-existing diseases not predictive of mortality include diabetes mellitus, hypertension, immune deficiencies, dehydration and alcoholism[20.] Presence of liver failure was not associated with mortality in a number of studies [41,21,29,18]. However, in a large study of ARF of Turney et al [25] and in a study of ARF in medical intensive care[20], liver failure was associated with mortality.

II.Treatment of ARF

Studies of therapy in ARF are often uninterpretable because of lack of information on the matching of prognostic factors in control and treated patients.

Central to the treatment of severe ARF is dialysis. Previously several groups have tried to study the effect of the intensity of dialysis on outcome using control populations and found no difference in out come. In a prospective trial by Gillum et al[46], the mortality in the intensive dialysis group was higher (59%) than in the non intensive group (47%) dialysed to keep the predialysis BUN below 100mg /dl.

Pagnini et al[47] recently showed a link between dialysis therapy and outcome in ICU patients with ARF; however this link was only present when the underlying co-morbidity was taken into account using the Cleveland clinic severity of illness score. Without factoring for co-morbidity, dialysis had no effect on survival.

In contrary to the above mentioned notion that intensive dialysis was not associated with better outcome, Two separate analysis have reported a better outcome with intensive dialysis. Schiff et al[48] recently reported the preliminary results of a trial in 72 critically ill patient with ARF who were randomized to either daily or alternative day dialysis using bio-compatible high flux dialysers. Overall mortality was significantly improved in the daily dialysis group (21% vs.47% for the alternative day group). When analysed in terms of delivered dialysis dose (Kt/V), mortality was 16% in the group receiving a weekly Kt/V greater than 6, which was significantly less than the 57 % mortality in patients receiving under dialysis (weekly Kt/V<3).

In a recent study of 160 patients with ARF [49,] patients were randomized to receive either intermittent hemodialysis (IHD) or daily hemodialysis (DHD). Both the groups were comparable with respect to age, sex, cause and severity of acute renal failure, medical or surgical intensive care setting and the APACHE Score. Daily hemodialysis resulted in better control of uremia, fewer hypotensive episodes during hemodialysis and more rapid resolution of acute renal failure. The mortality rate, according to intention to treat analysis was 28 % for daily dialysis and 46% for alternate day dialysis. In multiple regression analysis, less frequent haemodialysis was an independent risk factor for death.

Many studies have compared the mode of dialysis in determining the outcome of ARF patients. Prospective randomized trials are difficult to perform because hemodynamically unstable patients cannot tolerate haemodialysis, while it may be ethically problematic to confine a hemodyanamically stable patient to bed while receiving continuous renal replacement therapy (CRRT). A prospective trial from Barcelona failed to find any difference in survival [50].

In a multicenter, randomized controlled trial comparing two dialysis modalities (intermittent (IHD) vs. continuous hemodiafiltration) for the treatment of ARF in the

intensive care unit (ICU) 106 patients were randomised[51]. Continuous therapy was associated with an increase in ICU and in hospital mortality relative to intermittent dialysis. Despite the potential advantages of continuous techniques, this study produced no evidence of a survival benefit of continuous hemodiafiltration compared with IHD. However, despite randomization there were significant differences between the groups in several covariates independently associated with mortality including gender, hepatic failure, APACHE II and III scores and the number of failed organ systems, in each instances biased in favour of the intermittent dialysis group.

Laboratory Parameters

Potassium levels, sodium, hemoglobin, thyroid function have not been shown to be good predictors of outcome whereas metabolic acidosis, low platelet count, high bilirubin are significantly associated with high mortality[4,19,61,105] .

Index of Severity and Mortality

With the cost of medical care increasing tremendously, the need for assessing the prognosis and explaining it to the family becomes very pertinent to the treating physician. Various scoring systems, mostly illness severity scores, have been developed to optimize the use of clinical experience in the intensive care unit and to address questions of effectiveness, efficiency, quality of care and correct allocation of scarce resources. These indices also allow comparison of different units and randomization in clinical trials.

The general scoring systems are, however, inappropriate for disease specific populations such as patients in ARF. Since ARF creates an additional risk of mortality, disease specific scoring systems have been developed. One such was proposed by Liano et al[52]. Most of the severity scores available are complicated and require complex calculations.

Of the various severity scores described to measures the severity of ARF, APACHE II is the most widely used, both in ICU and non ICU settings. The APACHE II score[53] is the sum of three components, an acute physiological score (APS) where twelve variables including the Glasgow coma scale are considered, an age related score and chronic health evaluation score (CHE). Scores range from 0-71 with higher values having a worse prognosis. The APS is based on the worst physiological values during the first 24hours of admission. Though APACHE II is easier to use, it underestimates the risk of mortality of patients with acute renal failure.[22] APACHE II scores don't work because the proportion of the score allocated to renal failure is only 4% which de-emphasises the independent mortality risk of ARF. APACHE II scoring however was found promising in a retrospective analysis. No patients with APACHE score of more that 40 survived. However when APACHE score analysed prospectively did not predict the outcome[16].

However Parker et al[54] in a prospective multicenter controlled study concluded that the use of APACHE II score at the time of initiation of dialysis for patients with ARF is a statistically significant predictor of patient survival and recovery of renal function.

Fernandes et al [55] compared the performance of the APACHE II score with that of Acute Tubular Necrosis – individual severity score (ATN-ISS) proposed by Liano et al[52]. Similar data are obtained from APACHE and ATN – ISS score for both ICU and non ICU patients. Thus, they concluded that APACHE II score collected at hospital admission or at the time of referral to nephrologists and ATN-ISS score can be used as a severity of illness score .

Another scoring used in the ICU setting is version II of the Simplified Acute physiology score (SAPS II).[56] It is derived from 12 physiological variables, age, type of admission and three underlying variables. The resulting SAPS II score is then entered into a

published mathematical formula in which the solution gives the mathematical value of the predicted hospital mortality.

Recently Fiaccadorki et al [57] in a prospective study compared three general severity of illness scoring systems in predicting patient outcome from acute renal failure. (APACHE II, SAPS II and Version II of the mortality probability model at 24hours (MPM_{24} II). The APACHE II model was a slightly better calibrated predictor of group outcome in ARF patients as compared with the SAPS II and MPM_{24} II outcome prediction models. The MPM24IImodel showed the best discrimination capacity, in comparison with both APACHE II and SAPSII, but it constantly and significantly overestimated mean predicted mortality. However none of the models provide sufficient confidence for the prediction of outcome in individual patients.

Recently ARF specific severity index scores have been developed for all patients with ARF [52] and ICU patients with ARF [21]

Liano et al[52] have developed an accurate index that has been validated retrospectively and prospectively in several different populations. The index accurately predicted overall mortality in ICU and non-ICU ARF. Renal dysfunction accounts for 21% of the index and co-morbid illness accounts for the remainder. It also indicates the individual contributions of oliguria, hypotension, jaundice, coma and assisted ventilation. The biggest component is assisted ventilation which agrees with previous studies that have indicated the 80% mortality of those developing ARF while on a ventilator.

Drawbacks of the scoring systems

Most of the scoring systems described above are suitable for ICU setting and work quite well in the hospital in which they were developed but failed when extrapolated to other settings. The most widely used of the above, APACHE II has traditionally been performed at

the time of admission to ICU whereas the prognosis of patients with ARF requiring dialysis may best be determined at the time of dialysis initiation.[58]. Moreover, oliguira, which is an important predictor of outcome in ARF patients, has not been included among the variables. In developing countries like India, with meager resources, younger patients requiring ICU admissions are preferred over the elderly with similar co- morbid conditions. Younger age may be criterion for pre-selection of patients for admission to the ICU. Considering the above factors, a severity index developed in an ICU setting may not truly predict the outcome in a general population.

AIMS AND OBJECTIVES

AIMS AND OBJECTIVES

The aims of the study were:

a) To determine prospectively the variables predicting the outcome of patients with severe acute renal failure requiring haemodialysis admitted during a one year period.
b) To ascertain the aetiology of acute renal failure in patients requiring haemodialysis.

MATERIALS AND METHODS

MATERIALS AND METHODS

This study was conducted over a 1 year period (November 1, 2010– October 31, 2011) in patients admitted to the PSG IMSR who satisfied the following criteria :-

All patients admitted with severe ARF during the study period. Severe ARF was defined as any degree of ARF, which, in the opinion of the treating physician, required the commencement of renal replacement therapy.

Exclusion criteria:

Patients who had received RRT for indications other than ARF like, prevention of contrast nephropathy and drug poisoning; Known end-stage renal disease (ESRD) patients who had been receiving chronic renal dialysis before admission; Patients having been started on RRT for ARF in other units before admission. End stage renal Disease was defined as GFR <15 ml/min/1.73 m2 body surface area estimated by the Cockcroft- Gault equation i.e. KDOQI stage 5 or dialysis dependency

The Institutional Human Ethics Committee approved the study protocol.

A Prestructured Proforma was developed for the purpose of the study and the following information was obtained: Age, sex, date of admission to hospital and details of ICU or non ICU (ward) , patients history, physical examination and laboratory investigations on the day of admission , premorbid renal function, and serum creatinine at the time of initiation of haemodialysis. The main cause of acute renal failure (hypotension/ischemia, sepsis, septic shock, rhabdomyolysis, nephrotoxins, radiocontrast, other) was made according to the judgment of the clinician. Other investigations to look for the cause of renal failure were performed according to clinical assessment. Other Information obtained prior to the start of renal replacement of therapy such as the use of mechanical ventilation, ionotropic /

vasopressor drugs, the serum creatinine and bilirubin values, the Glasgow coma score, and urinary output for the preceding 24 h.

Information was also obtained on patient outcome, hospital mortality, number of days of renal replacement therapy, patients who developed ESRD, and duration of hospital stay renal Intermittent HD Was the RRT modes used in all the patients A double – lumen catheter was used for vascular access in all cases. The femoral position was chosen in 80 (70.2%) patients, and the jugular in 34 patients (29.8%). The Polysulfone Diacap (Low Flux 1.2$m^{2,}$ KUF 7.9 B Braun Germany) membrane was used in all patients. The approach to anticoagulation was dependant on patient coagulation profile with either heparin free or intermittent heparin as advised by clinician.

Renal biopsy was performed on patients in whom the cause of ARF was not clear at the outset or if renal failure due to glomerular disease, renal failure not improving after 3 months of treatment.

Patients were classified as oliguirc or non oliguric based on lowest daily urine output during the azotemic phase. Oliguria was defined as a urine volume less than 400ml/day.

Causes of renal failure were classified as follows:

Medical: a) All cases of acute tubular necrosis with a medical cause b) Intrinsic renal disease patients with glomerulonephritis, vasculitis, haemolytic uremic syndrome etc.

Surgery: Those patients who had predominantly surgical cause for admission and those subsequently developed ARF following road traffic accidents.

Obstetric: Renal failure due to obstetric causes.

In order to assign a possible cause for ARF, following criteria were applied:

Sepsis was considered to be present when two or more of the following were present as a result of systemic infection. (i) temperature > 38 ^{o} C or < 36 o C (ii) heart rate > 90/mt (iii) respiratory rate > 20/mt or Pa CO_2 < 32 mm and (iv) WBC > 12000/mm3, <4000/mm3 or <20 % band form [59].

Organ dysfunction

We recorded the organs and systems that had failed at the time of initiation of hemodialysis according to the following criteria, which were defined in the PROWESS study [60]:

Cardiovascular: Shock: systolic arterial pressure ≤90 mmHg or mean arterial pressure ≤70 mmHg, during at least 1 hour despite adequate resuscitation with fluids or adequate intravascular volume; or use of vasopressors (dopamine ≥5 µg/Kg/minute; noradrenaline or adrenaline at any dose; dobutamine was not taken into account). Unexplained metabolic acidosis (pH <7.30 or base excess ≤-5 mmol/l) associated with an arterial lactate concentration ≥ 2 mmol/l with no other apparent cause.

Respiratory: mechanical ventilation; or PaO2/FiO2 <250 mmHg if other organ dysfunction was present; or PaO2/ FIO2 < 200 mmHg if only pulmonary dysfunction was present.

Nervous system: encephalopathy with GCS <13 without sedation unexplained by other causes.

Liver: bilirubin >3 mg/dl or increase in prothrombin time related to a hepatic cause. **Hematological**: platelets <80,000/ml^3 or decrease of 50% in the 3 previous days.

Stopping of hemodialysis: is considered if serum creatinine <3, normal serum electrolytes normal urine output.

The outcome measured was hospital mortality, patients who developed ESRD. Relationship between demographics, premorbidities and clinical parameters with above outcome measures were studied.

The influence of various factors such as (1) age of patient (2) premorbidities like (i) cardiac, (ii) Liver failure, (iii) hypertension and (iv) diabetes (3) serum creatinine at the time of admission and at the time of initiation of dialysis (4) presence or absence of oliguria (5) Presence of organ dysfunction (6) Major cause of acute renal failure (7) duration of dialysis on the outcome of acute renal failure patients were analysed.

STATISTICAL ANALYSIS

Data were expressed as number of patients (%) for categorical data or mean ± standard deviation (SD) for numerical data unless specified. Fisher's exact test was used for categorical data and Mann-Whitney U test and student t test for continuous data in univariate analysis with survivors and non survivors as dependent variable. A p value of less than 0.05 was considered as significant. Multivariate analysis was performed using survivors and non survivors as dependent variable. Multiple logistic was performed for organ dysfunction. Data analysis was performed by SPSS version 12 (SPSS Inc., Chicago, Ill).

OBSERVATIONS & RESULTS

OBSERVATIONS & RESULTS

One hundred thirty eight patients developed severe acute renal failure requiring acute renal replacement therapy during the 12-mo study period from 1st November 2010 to 31st October, 2011. Among these, 24 patients were excluded. Reasons for exclusion were (not mutually exclusive): 3 received RRT for indications other than ARF (eg drug poisoning); 5 had underlying ESRD; 4 patients were started RRT for ARF from other units before admission. In 12 patients outcome could not be ascertained, as they were either discharged on request or left against medical advice before recovery. These patients were excluded from the analysis of outcome. Finally, the data of 114 patients were analyzed.

Table 2 shows the demographic variables of our study population

The mean age of these patients was 52.95 $\pm$ 15.75 (range 18-89 years). The total number of males were 72 (63.2%) and 42 were females (36.8%). Of these patients 84 (73.7%) got admitted in ICU and 30(26.3%) in ward.

Pre morbid disease at the time of presentation included cardiovascular disease in 16 (14%), liver disease in 11 (9.6%), hypertension in 21 (18.4%), diabetes mellitus (DM) in 34 (29.8%),preexisting chronic renal disease in 10 (8.8%)patients.

Of the 114 patients, 96(84.2%) were admitted under medical, 16(14%) under surgical and 2 (1.8%) under obstetric specialities.

Sepsis contributed to ARF in 46 patients (40.4%), Hypovolemic shock in 11 patients (9.6%), Hepatorenal syndrome in 11 patients (9.6%) Cardiogenic shock in 10 patients (8.8%) , acute glomerulonephritis in 7 (6.1%), Obstructive renal failure in 6 patients(5.3%) ,drug related ARF, malaria, acute pancreatitis, following major surgery in 4 patients each(3.5%),

post CABG, snake bite, rhabdomyolysis in 2 patients each (1.8%),pregnancy related ARF in 1 patient (0.9%).

The mean creatinine in the study population was 5.36 ± 2.78 mg/dl .The mean duration of hospital stay was 12.09 ± 8.23 days with a range of 2-50days. The mean duration of hemodialysis was 12.81± 18.2 days.

Of the 114 patients, 49 died (42.98%), 61 (53.5%) recovered to have normal renal functions or mild renal dysfunction not requiring hemodialysis during follow up and 4 patients (3.5%) progressed to end state renal disease (ESRD) .

In non ICU (ward) patients , the mortality is 6 (12.2 %) , whereas, it is 43 (87.8%) in the ICU setting .

Univariate Analysis

The following observations were made on univariate analysis (Table 3).

Premorbidities:

Chronic liver disease was seen in 11 patients (9.6%), of whom 9 patients died (81.8%). Mortality in those without liver disease was 40 (38.8%). This difference was statistically significant for mortality(p 0.008)).

Preexisting cardiac disease was seen in 16 patients (14%), of whom 10 patients died (62.5%). Mortality in those without preexisting cardiac disease was 39 (39.8%). However this difference was not statistically significant for mortality ($p>0.05$).

Presence of diabetes was not significantly associated with mortality. A total of 34 patients were diabetic (29.8%) and 9 (26.5%) of them died. .

Preexisting renal disease was seen in 10 patients (8.8%), of whom 1 patient died (10%) . Mortality rate among those with pre-existing renal disease was not significant.

Hypertension was seen in 21 patients (18.4%), of whom 7 patients died (33%). Mortality rate among those with preexisting renal disease was not significant

Cause of ARF

Presence of sepsis was not associated with significantly poor outcome ($p>0.05$). Of the 46 (40.4%) patients with sepsis, 20 died (43.5%) whereas 29 (42.6%) who did not have sepsis at admission died.

Hypovolemic shock at the time of admission was observed in 11 patients (9.6%). Two (18.2%) out of the eleven patients expired whereas 47 patients who did not have hypovolemic shock died (45.6%). Presence of hypovolemic shock was thus not associated with higher mortality.

Hepatorenal syndrome was observed in 11 patients (9.6%). 9(81.8%) out of the eleven patients expired whereas 40 patients who did not have hepatorenal syndrome died (38.8%). Presence of hepatorenal syndrome was significantly associated with higher mortality ($p<0.05$).

Cardiogenic shock at the time of admission was observed in 10 patients (8.8%). Eight (80%) out of the ten patients expired whereas 41 patients who did not have cardiogenic shock at the time of presentation died (39.4%). Presence of cardiogenic shock was thus associated with higher mortality ($p<0.05$).

Acute glomerulonephritis was observed in 7 patients (6.1%). one(14.3%) out of the seven patients expired whereas 48 patients who did not have primary renal disease died (44.9%). Presence of primary renal disease was thus not associated with higher mortality.

Renal failure secondary to acute pancreatitis, and malaria was seen in 4 (3.5%) patients each and mortality associated with these diseases was not significant.

Renal failure secondary to snake bite and major surgery was seen in 2 and 4 patients respectively and all these patients expired.

Other aetiologies like obstruction, nephrotoxic medications, post CABG, rhabdomyolysis, and pregnancy related renal disease were not associated with any mortality.

ARF was oliguiric in 97 patients (85.1%) and non oliguric in 17 patients (14.9%). 49 of the oliguirc patients (50.5%) died whereas none of the nonoliguric patients died. Univariate analysis revealed significant difference between the two groups ($p<0.05$).

Requirement of Mechanical Ventilator support was observed in 44 patients(38.6%)and 34 (77.3%) of them expired whereas 15 patients (21.4%) not requiring Mechanical ventilation died. Univariate analysis revealed significant difference between the two groups ($p<0.05$).

Requirement of Ionotropic support was observed in 59 patients(51.8%)and 41 (69.5%) of them were expired whereas 8 patients (14.5%) not requiring Ionotropic support died. Univariate analysis revealed significant increase in mortality among that requiring ionotropic support. ($p<0.05$).

The GCS score of $\leq$8 was present in 18 patients out of which 16 patients died and low GCS score is associated with significant mortality. ($p <0.05$) (Table 4)

Organ Dysfunction

Stepwise Multiple regression has been performed to check the impact of the organ dysfunction present at the time of initiation of hemodialysis . (Table 5,5a). Factors such as Creatinine, GCS, Platelet Count, Bilirubin, Syst BP<90 mm of Hg, Mech Ventilation on the dependent variable i.e., Survivor or Non survivor. From the above table 5 it is clear that when platelet count is entered, it shows an impact of 4% , when Mech Ventilation and Platelet Count is taken it shows an impact of 31%, when Syst Bp<90 mm of Hg, Platelet Count and Mech Ventilation Is taken for study it shows an impact of 38.9%, when serum Bilirubin, Mech Ventilation, Platelet Count and Syst BP<90 mm of Hg is taken for study it shows an impact of 43.8%, when GCS, Platelet Count, serum Bilirubin, Syst BP<90 mm of Hg and Mech Ventilation is taken for study it shows an impact of 48.1%, when Creatinine, GCS, Platelet Count, serum Bilirubin, Syst BP< 90 mm of Hg and Mech Ventilation is taken for study it shows an impact of 48.1%

When all the variables are taken for the study, the Beta values and Significant values are listed in the above table 5a. From the study it is clear that out of the six variables taken for study, SYST BP<90 mm of Hg, Bilirubin and GCS shows significant relationship with the dependent variable of Survivor or Non Survivor

Among other factors analysed, age, sex was not significantly different between the survivors & nonsurvivors.

Mean peak serum creatinine at the time of initiation of dialysis was also significantly higher among survivors (5.62 ± 2.72 mg/dl vs. 5.01 ± 2.84 mg/dl). Mean serum bilirubin at the time of initiation of dialysis was significantly higher among nonsurvivors (5.95 ± 7.79 mg/dl vs. 1.73 ± 2.3 mg/dl). Mean arterial lactate at the time of initiation of dialysis was significantly higher among nonsurvivors (6.91 ± 4.96 mg/d vs. 2.27 ± 1.94 mg/dl) Mean

platelet count at the time of initiation of dialysis was significantly lower among nonsurvivors (1, 61,142. 85± 1, 05,188.32 vs. 216843.75 ± 131184.37). (TABLE 6)

The mean duration of hospital stay among survivors not requiring hemodialysis was 14.06 ±7.38, survivors with ESRD was 11± 4.08and non survivors was 9.73 ± 8.93 days. The mean duration of dialysis among survivors who recovered renal function and not on hemodialysis was 12.41 ± 12.66 days vs. 7± 7 days among non survivors .

The following factors were associated with hospital mortality by univariate analysis: history of chronic liver disease causes of ARF like cardiogenic shock, hepatorenal syndrome,use of vasopressors and mechanical ventilation,low urine output,serum creatinine , bilirubin,lactate,platelet count at the time of initiation of haemodialysis. The results are summarized in Table 3,6

Multivariate analysis

Multivariate analysis was performed (Table 7). Parameters directly related to ARF and found significant association with mortality were chronic liver disease, preexisting heart disease, requirement of mechanical ventilation, oliguria, sepsis, cardiogenic shock, admission in ICU.

Of those patients who survived, 61 (53.5%) recovered to have normal renal functions or mild renal dysfunction not requiring hemodialysis on follow up and 4 (3.5%) progressed to ESRD. These two groups were separately analysed (Table 8).

Among males 3 of the total 65 (4.6%) survivors developed end stage disease (ESRD). Among females 1 (1.5%) of the 65 survivors developed ESRD. Of those patients who developed ESRD all had medical causes of ARF. None of those with surgical, obstetric causes progressed to ESRD.

Among the causes of ARF, sepsis, hypovolemic shock ,cardiogenic shock, pigment nephropathy, toxic nephropathy,obstruction,pancreatitis,pregnancy related ARF,malaria,post CABG and AIN did not predict the occurrence of ESRD. However, those patients who were diagnosed to have acute glomerulonephritis as the cause of ARF were more prone to ESRD (, $p<0.05$)).

The mean age of the patients who developed ESRD did not differ from those who recovered renal functions completely (44.5±8.18 years vs. 52.62±15.7 yrs $p>0.05$). The duration of dialysis, as expectedly was significantly different between the two groups (90±00days and 12.41±12.26 days, $p<0.05$).

Peak serum creatinine was 5.59±2.79 mg/dl in patients who recovered and 5.97±1.34 mg/dl in patients who developed ESRD

TABLES & FIGURES

TABLES & FIGURES

TABLE 2 Demorphics of Study Population

TOTAL	114
MEAN AGE (yrs)	52.95 ± 15.75
Males : Females	72:42
SPECIALITY	
Medical	96(84.2%)
Surgical	16(14%)
Obstetrics	2(1.8%)
Cause of ARF	
Sepsis (%)	46(40.4%)
Hypovolemic shock	11(9.6%)
Cardiogenic shock	10(8.8%)
Hepatorenal syndrome	11 (9.6%)
Acute glomerulonephritis	7 (6.1%)
Drug induced renal failure	4 (3.5%)
Acute Pancreatitis	4 (3.5%)
Malaria	4 (3.5%)
Snake Bite	2 (1.8%)
Obstructive Renal failure	6 (5.3%)
Following major surgery	4 (3.5%)
Post CABG	2 (1.8%)
Rhabdomyolysis	2 (1.8%)
Pregnancy Related	1 (0.9%)
Mean Duration of Hospital stay(days)	12.09 ± 8.23
Duration of Dialysis (days)	12.81 ± 18.2
Oliguria: Non oliguria	97:17
ICU:NON ICU	84:30
Mean Serum Creatinine	5.36 ± 2.78
OUTCOME	
Non survivors	49
Recovered or mild renal dysfunction	61
ESRD	4

Table 3 Total population co morbidities, cause of renal failure, organ failure (Fishers Exact test)

Disease	All patients		Survivor				Non Survivor				P value
	Present	Absent	Present	%	Absent	%	Present	%	Absent	%	
Diabetes	34	80	25	73.5	40	50.0	9	26.5	40	50.0	0.016
Hypertension	21	93	14	66.7	51	54.8	7	33.3	42	45.2	0.230
Heart	16	98	6	37.5	59	60.2	10	62.5	39	39.8	0.077
Liver	11	103	2	18.2	63	61.2	9	81.8	40	38.8	0.008
Preexisting chronic Renal disease	10	104	9	90.0	56	53.8	1	10.0	48	46.2	0.026
Sepsis	46	68	26	56.5	39	57.4	20	43.5	29	42.6	0.541
Hypovolemic shock	11	103	9	81.8	56	54.4	2	18.2	47	45.6	0.073
Heart failure	10	104	2	20.0	63	60.6	8	80.0	41	39.4	0.016
Hepatorenal Syndrome	11	103	2	18.2	63	61.2	9	81.8	40	38.8	0.008
Acute glomerulonephritis	7	107	6	85.7	59	55.1	1	14.3	48	44.9	0.115
Acute Pancreatitis	4	110	2	50.0	63	57.3	2	50.0	47	42.7	0.578
Malaria	4	110	3	75.0	62	56.4	1	25.0	48	43.6	0.422
Snake bite	2	112	0	0.0	65	58.0	2	100.0	47	42.0	0.183
Drug induced renal failure	7	107	1	100.0	64	56.6	0	0.0	49	43.4	0.570
Obstructive renal failure	6	108	6	100.0	59	54.6	0	0.0	49	45.4	0.031
Following major surgery	4	110	0	0.0	65	59.1	4	100.0	45	40.9	0.032
Post CABG	2	112	2	100.0	63	56.2	0	0.0	49	43.8	0.323
Rhabdomplysis	2	112	2	100.0	63	56.2	0	0.0	49	43.8	0.323
Pregnancy related	1	113	1	100.0	64	56.6	0	0.0	49	43.4	0.570
Urine output	97	17	48	49.5	17	100.0	49	50.5	0	0.0	0.000
VASOACTIVE DRUGS	59	55	18	30.5	47	85.5	41	69.5	8	14.5	0.000
Mech Ventilation	44	70	10	22.7	55	78.6	34	77.3	15	21.4	0.000

TABLE 4 Relationship between GCS & Survivor or Non survivor

GCS Score	Survivor	Non Survivor	Total	P value
Less than or equal to 8	2(3.1%)	16(32.7%)	18(.8%)	0.000
9-12	8(12.3%)	24(49.0%)	32(28.1%)	
More than or equal to 13	55(84.6%)	9(18.4%)	64(56.1%)	
Total	65(100.0%)	49(100.0%)	114(100.0%)	

TABLE 5 Multiple regression analysis

Variables Entered	R	R Square	Adjusted R Square
Platelet count	0.225	0.051	0.042
Mech Ventilation, Platelet Count	0.568	0.322	0.310
Syst BP<90 mm of Hg, Platelet Count, Mech Ventilation	0.637	0.406	0.389
Bilirubin, Mech Ventilation, Platelet Count, Syst BP<90 mm of Hg	0.677	0.458	0.438
GCS, Platelet Count, Bilirubin, Syst BP<90 mm of Hg, Mech Ventilation	0.710	0.504	0.481
Creatinine, GCS, Platelet Count, Bilirubin, Syst BP<90 mm of Hg, Mech Ventilation	0.714	0.509	0.481

TABLE 5A Multiple regression analysis

Coefficients					
Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1. (Constant)	2.626	0.178		14.730	0.000
Platelet Count	-4.289E-7	0.000	-0.106	-1.495	0.138
Mech ventilation	-0.119	0.106	-0.117	-1.119	0.266
Syst BP<90 mm of Hg	-0.254	0.096	-0.256	-2.640	0.010
Bilirubin	0.017	0.007	0.198	2.624	0.010
GCS	-0.054	0.019	-0.331	-2.835	0.005
Creatinine	0.014	0.014	0.081	1.053	0.295

a. Dependent Variable: Survivor or Non survivor

TABLE 6 Mann Whitney U tests

	Survivor	Non Survivor	Total	P value
Hb (Mean ± SD)	11.13 ± 2.23	11.43 ± 2.83	11.26±2.51	.826
TLC(Mean ± SD)	15658.46±6398.65	20602.04±12730.81	17783.33±9903.36	.012
Platelet Count(Mean ± SD)	216843.75± 131184.37	161142.85± 105188.32	193631.5789 ± 123116.1236	.020
S.Sodium(Mean ± SD)	133.49±7.14	131.84±8.24	132.7807 ±7.65	.203
S.Potassium(Mean ± SD)	4.64±1.26	5.04±1.42	4.81±1.34	.119
Arterial PH(Mean ± SD)	7.29±.078	7.20±.132	7.25±0.11	.000
Arterial Lactate(Mean ± SD)	2.27±1.94	6.91±4.96	4.26±4.23	.000
S. Creatinine(Mean ± SD)	5.62±2.72	5.01±2.84	5.36±2.78	.045
S. Bilirubin(Mean ± SD)	1.73±2.30	5.95±7.79	3.55±5.75	.000
GCS(Mean ± SD)	14.35±1.59	10.33±2.99	12.62±3.04	.000

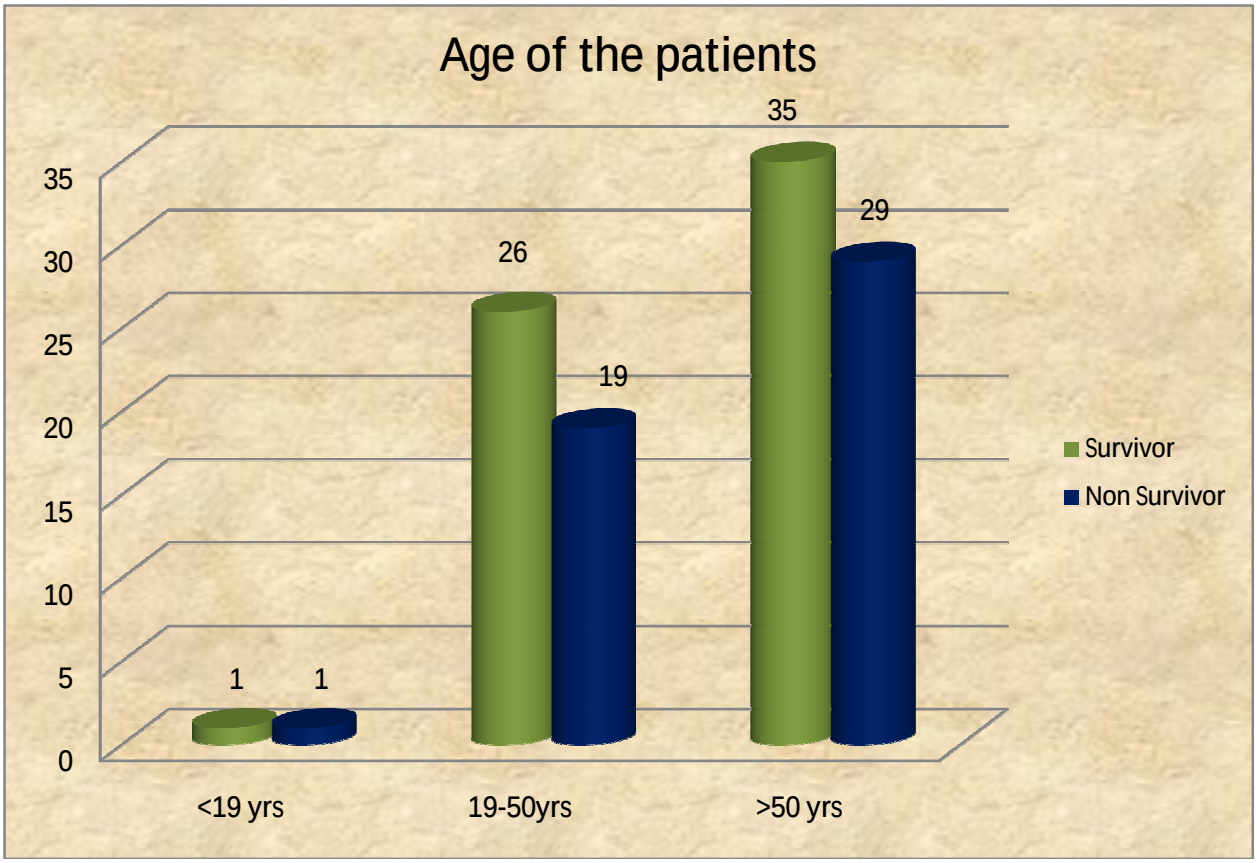
Table : 7 Variables predicting outcome in total population (Multivariate analysis)

Factor	B	Sig
Age	-.020	.170
Sex	-.418	.278
Cormorbidities		
Diabetes	-.656	.095
Hypertension	.142	.750
Heart disease	2.131	.026
Liver disease	-5.601	.000
Preexisting chronic renal disease	.073	.885
ARF Cause		
Sepsis	3.035	.000
Hypovolemic shock	1.875	.026
Cardiogenic shock	7.054	.000
Hepatorenal Syndrome	2.368	.154.
Acute glomeulonephritis	.250	.784
Drug induced renal failure	2.876	.033
Acute Pancreatitis	2.638	.073
Malaria	.004	.997
Snake bite	13.073	.990
Obstructive renal failure	1.385	.179
Following major surgery	14.861	.963
Post CABG	4.186	.020
Rhabdomplysis	5.044	.001
Pregnancy related	7.223	.000
Ward	1.098	.010
Mechanical Ventilation	-3.559	.000
Vasoactive drugs	-.079	.869
Urine output	.950	.028

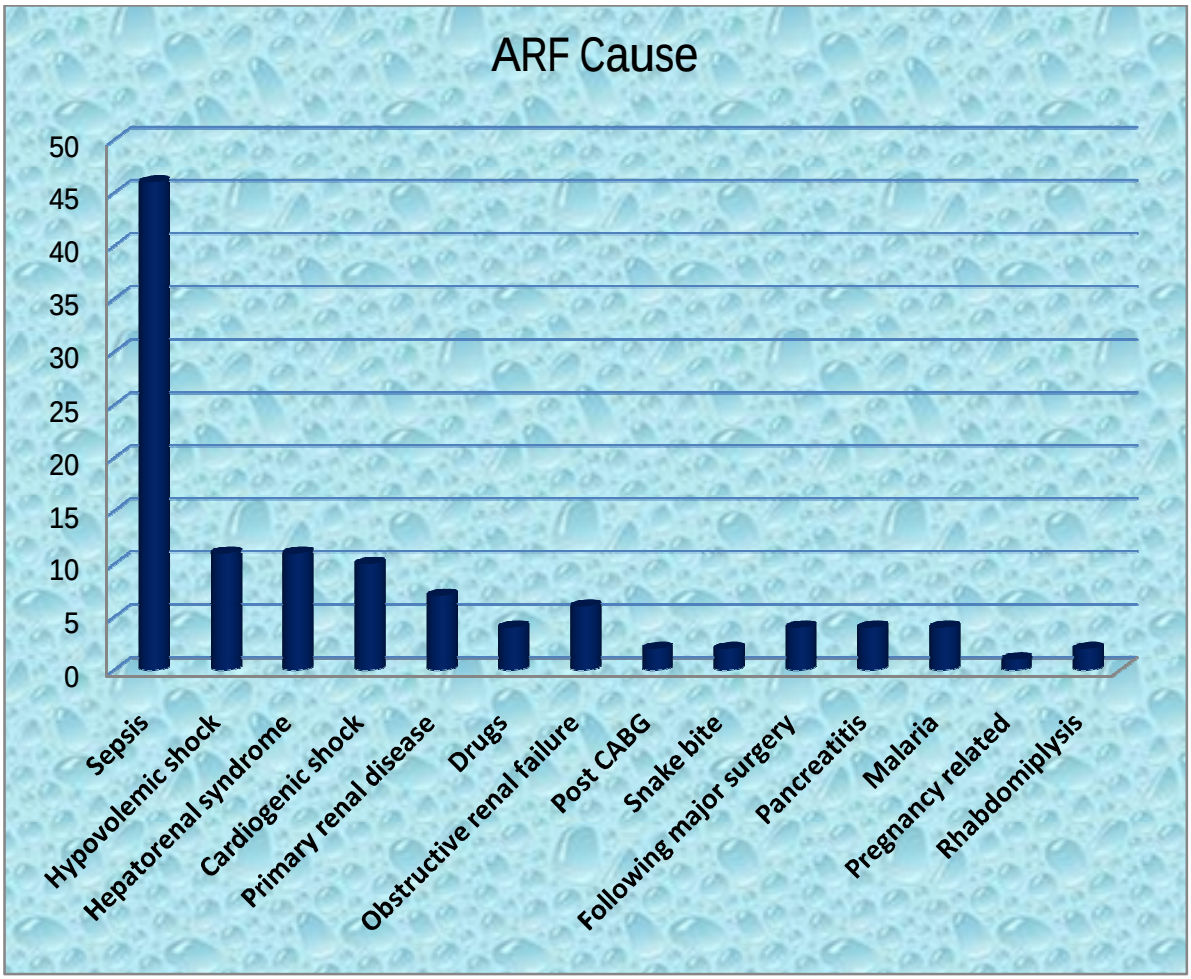
Table : 8 All survivors Characteristics (Mann whitney u test and Student t-test)

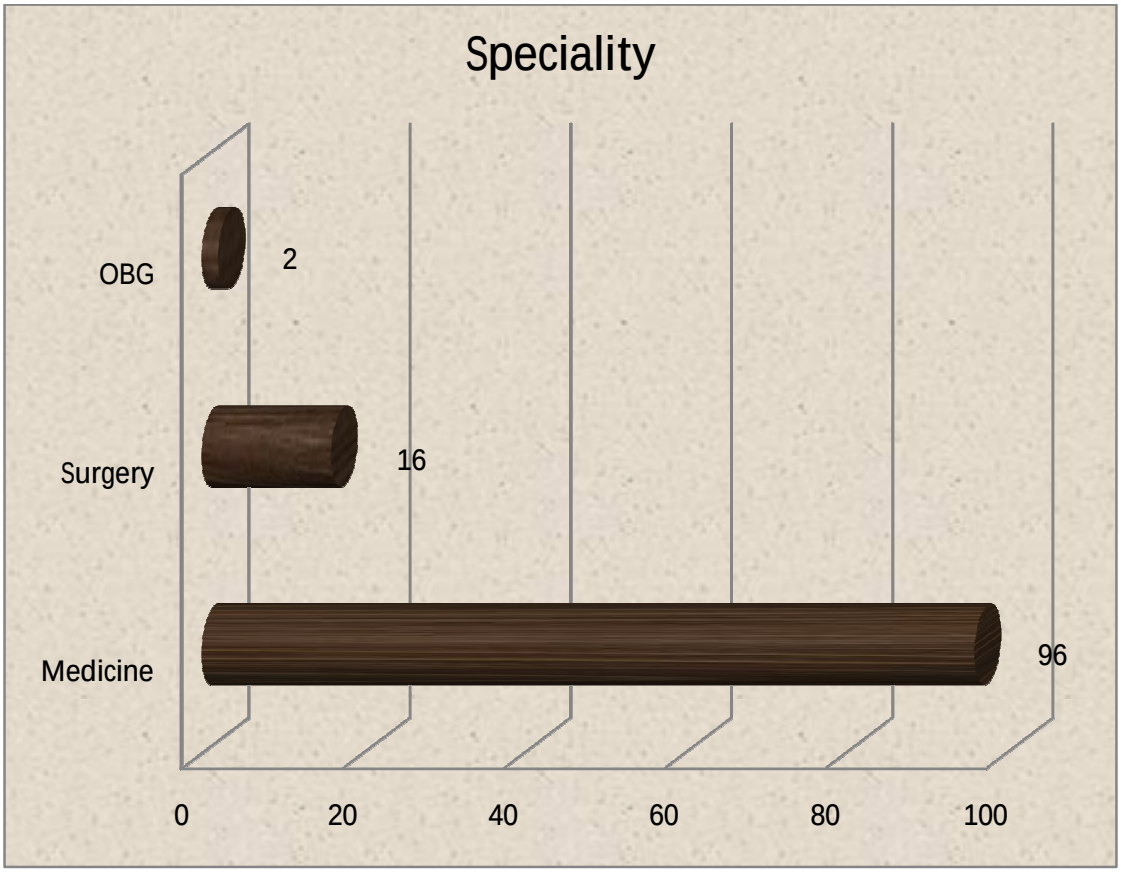
	Recovered	ESRD	P value
Age(Mean ± SD)	52.62 ± 15.70	44.50 ± 8.18	**.257**
Sex (n %)			
Male	35(57.4)	3(75.0)	.496
Female	26(42.6)	1(25.0)	
Pre morbidities (n %)			
Diabetes(n %)			
Yes	23(37.7)	2(50.0)	0.631
No	38(62.3)	2(50.0)	
Hypertension (n %)			
Yes	11(18.0)	3(75.0)	0.007
No	50(82.0)	1(25.0)	
Heart disease(n %)			
Yes	6(9.8)	0(0.0)	0.518
No	55(90.2)	4(100.0	
Liver disease (n %)			
Yes	2 (3.3)	0 (0.0)	0.718
No	59(96.7)	4(100.0)	
Preexisting chronic renal disease(n %)			
Yes	9(14.8)	0(0.0)	0.416
No	52(85.2)	4(100.0)	
Speciality(n %)			
Medicine	48(78.7)	4(100.0)	0.338
Surgery	11(18.0)	0(0.0)	
OBG	2(3.3)	0(0.0)	
ARF Cause(n %)			
Sepsis	26(42.6)	0(0.0)	0.095
Hypovolemic shock	9(14.8)	0(0.0)	0.416
Cardiogenic shock	2(3.3)	0(0.0)	0.718
Hepatorenal Syndrome	2(3.3)	0(0.0)	0.718
Acute glomerulonephritis	2(3.3)	4(100.0)	0.000
Drug induced renal failure	4(6.6)	0(0.0)	0.800
Pancreatitis	2(3.3)	0(0.0)	0.718
Malaria	3(4.9)	0(0.0)	0.656
Snake bite	0(0.0)	0(0.0)	-
Obstructive renal failure	6(9.8)	0(0.0)	0.518
Following major surgery	0(0.0)	0(0.0)	-
Post CABG	2(3.3)	0(0.0)	0.718
Rhabdomplysis	2(3.3)	0(0.0)	0.718
Pregnancy related	1(1.6)	0(0.0)	0.800
Mechanical Ventilation(n %)			
Yes	10(16.4)	0(0.0)	0.387
No	51(83.6)	4(100.0)	

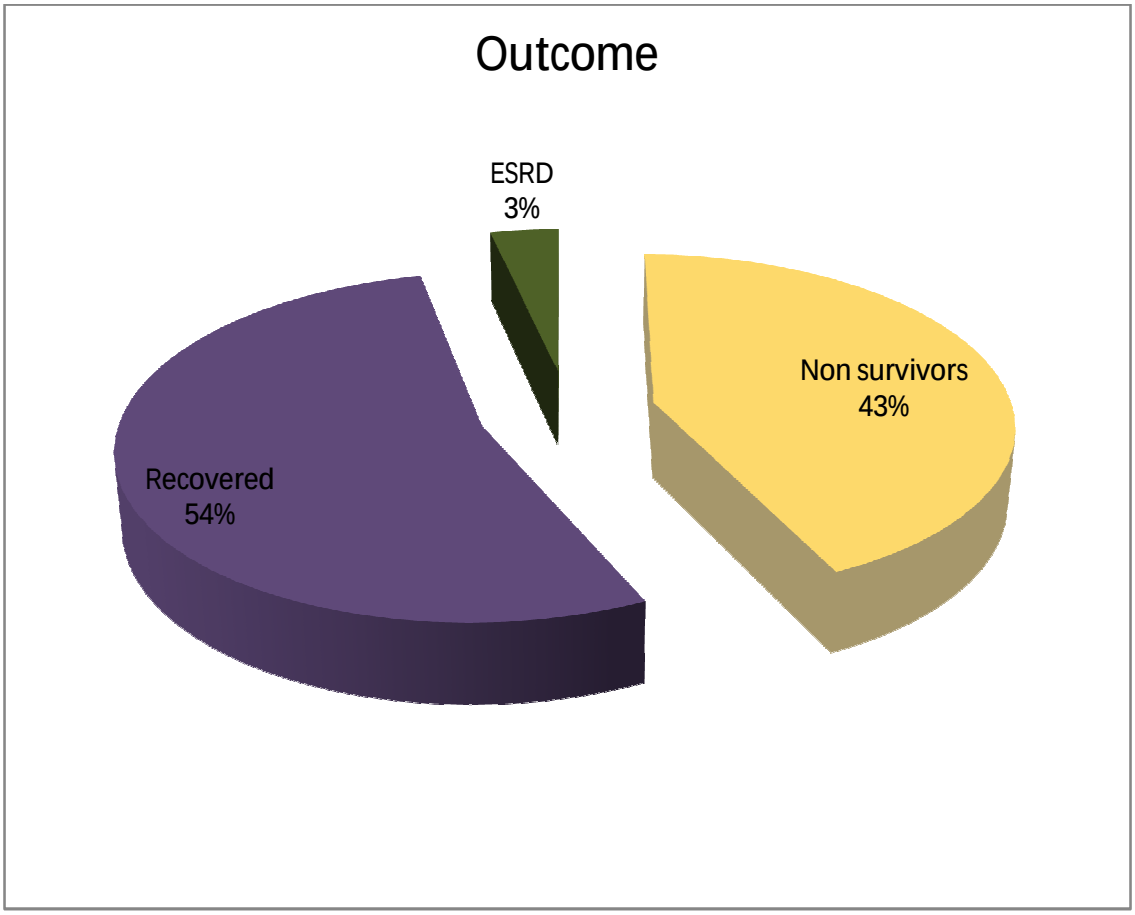
	Recovered	ESRD	P value
Vasoactive drugs(n %)			
Yes	18(29.5)	0(0.0)	0.207
No	43(70.5)	4(100.0)	
Urine output(n %)			
Yes	44(72.1)	4(100.0)	0.226
No	17(27.9)	0(0.0)	
Hospital LOS (days) (Mean ± SD)	14.06 ± 7.38	11.0 ± 4.08	0.450
Duration of RRT (days) (Mean ± SD)	12.41 ± 12.66	90.0 ± 0.0	0.001
Ward(n %)			
ICU	37(60.7)	4(100.0)	0.118
No ICU	24(39.3)	0(0.0)	
Hospital LOS (days) (Mean ± SD)	14.06 ± 7.38	11.0 ± 4.08	0.450
Ward(n %)			
ICU	37(60.7)	4(100.0)	0.118
No ICU	24(39.3)	0(0.0)	

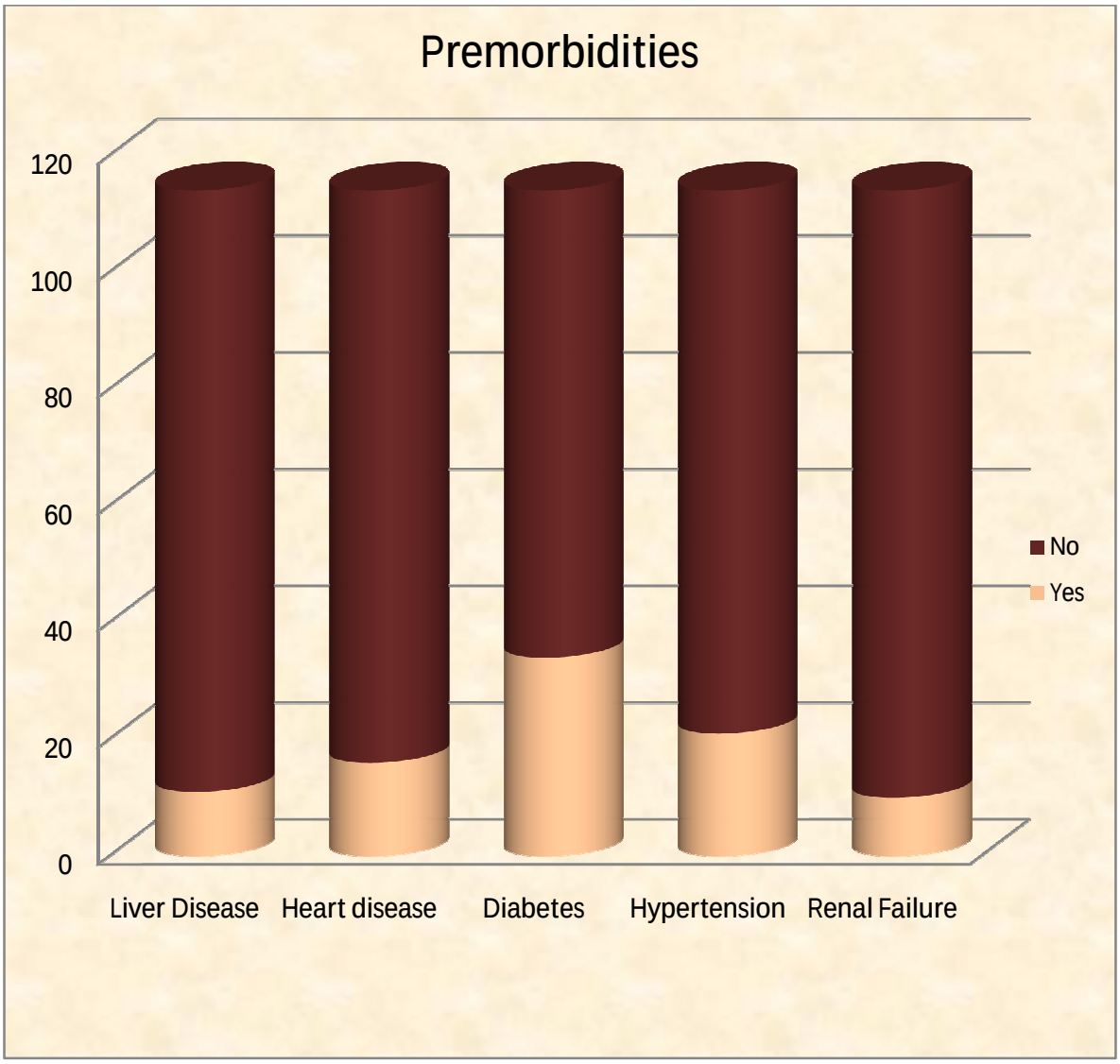

Age of the patients
35
30
25
20
15
10
5
0
1
1
26
19
35
29
<19 yrs
19-50yrs
>50 yrs
Survivor
Non Survivor

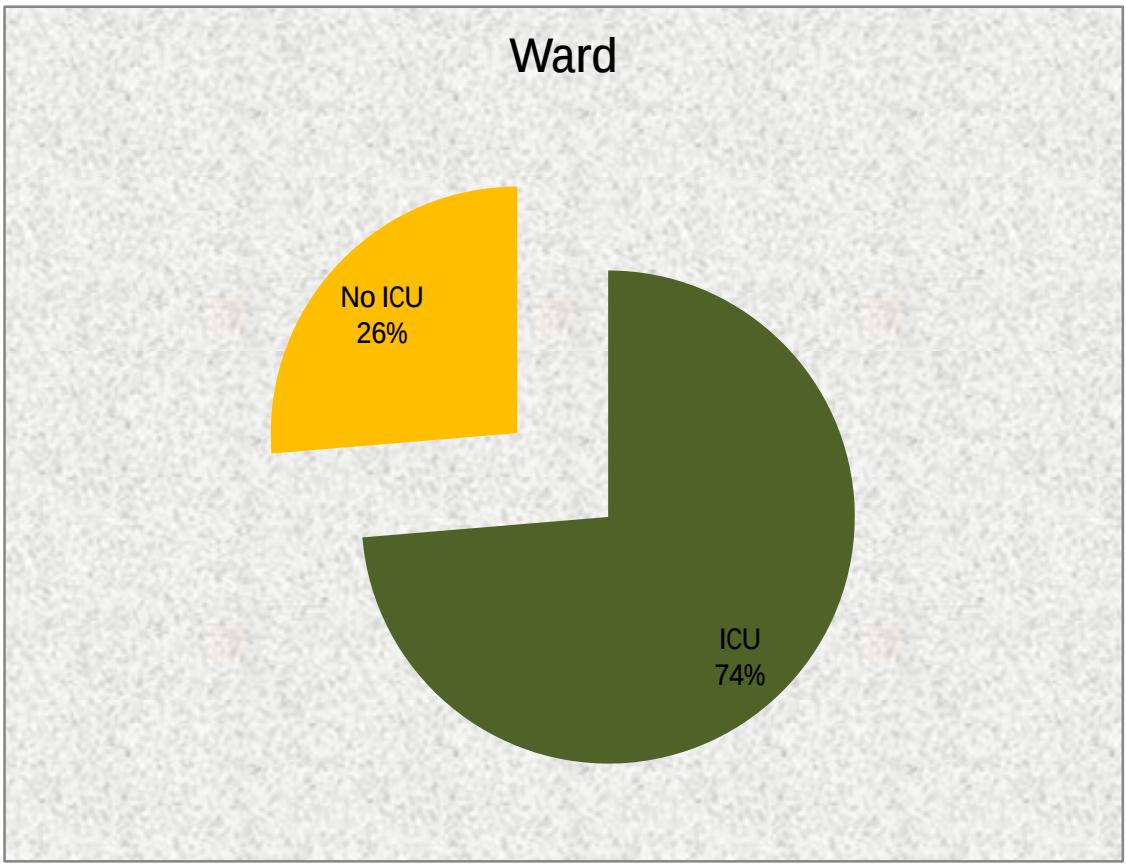

Sex
Female
37%
Male
63%


ARF Cause
50
45
40
35
30
25
20
15
10
5
0
Sepsis
Hypovolemic shock
Hepatorenal syndrome
Cardiogenic shock
Primary renal disease
Drugs
Obstructive renal failure
Post CABG
Snake bite
Following major surgery
Pancreatitis
Malaria
Pregnancy related
Rhabdomiplysis


Speciality
OBG
2
Surgery
16
Medicine
96
0
20
40
60
80
100


Outcome
ESRD
3%
Non survivors
43%
Recovered
54%


Premorbidities
120
100
80
60
40
20
0
Liver Disease
Heart disease
Diabetes
Hypertension
Renal Failure
No
Yes


Ward
No ICU
26%
ICU
74%

DISCUSSION

DISCUSSION

This study was done in prospective manner to determine the variables predicting the outcome of ARF requiring hemodialysis, in patients admitted to PSGIMSR over a period of 1 year (1st Nov 2010 to 31st Oct 2011).

Etiology of ARF

In recent years, improvements in socioeconomic conditions, rapid industrialization, expanding medical facilities and developments in the preventive aspects have led to near eradication of ARF due to infections and obstetrical causes in the west.

ARF in the western societies is now largely a consequence of road traffic accidents, cardiovascular surgery, drugs, multi-organ failure and renal transplant rejection [25]. This sharp decline in the incidence of community acquired ARF in the developed countries contrasts with hospitals in tropical countries which continue to cater to ARF associated with diarrheal diseases, obstetrical accidents, toxins and infections specific and unique to their respective regions, The patterns of ARF encountered in the tropics have, however, shown changes similar to those in the west, though at a much slower pace [28] . Amongst the medical causes of ARF, etiological factors leading to ARF in tropical countries are very different from those seen in the developed world. Diarrheal diseases, intravascular hemolysis due to G6PD deficiency, copper sulfate poisoning, snake bites and insect stings together constitute over 40% of all causes of ARF in India and these causes are rarely encountered in the west [28,62] .

Amongst the other important differences is the younger age of patients developing ARF in the tropics. In the West, the median age of patients has increased from 41.3 years in the 1950s to 60 years in the 1980s [25] . On the other hand, the average patient dialyzed for ARF in the tropical countries is younger and is in the 4th decade of life [63, 64, 65].

Haemodialysis facilities are not widely available in the underdeveloped countries of the tropics and even peritoneal dialysis (PD) is available only in the major townships. Therefore, it is quite common to see patients presenting with severe and life threatening complications of renal failure requiring emergency management including dialysis. Finally, it is not uncommon to see patients in the tropics with common and treatable diseases presenting with major complications including renal failure simply because of poverty, ignorance and inadequate access to medical care.

A total of 114 (Males 72, Females 42) patients with ARF were seen during the study period. Etiologilcally patients were divided into medical (84.2%), Surgical (14%) and obstetric (1.8%) groups.

Although younger age patients develop ARF in the tropics[63,64,65] . The mean age of our patients was 52.95 $\pm$15.75years This was similar to the age group in other studies done by Liano et al [29] and Feest et al [35]

Septicemia was the most common cause of severe ARF in our study which is similar to other studies[66,67,68,69,70]. This information highlights the fact that any successful way of decreasing the incidence of severe ARF is likely to be based on the development of more effective therapies for the prevention or rapid treatment of sepsis.

Diarroheal diseases showed a significant decline (9.6%) compared to previous studies[28,70] . Similarly Snake bites was a common cause of ARF in the prevous studies but our study showed decreased incidence probably due to tertiary care and private set up .

The incidence of surgical ARF in our centre is 16(14%) patients and obstructive Uropathy form stones are the most frequent aetiology. This is similar to study done by Sakhuja etal[71] in which ARF due to obstructive uropathy constitutes a major cause of

surgical ARF. Trauma and operative complications contribute to only 2-5% of cases of community-acquired ARF in the tropics. Whereas road traffic accidents, drugs, complicated cardiac, vascular and abdominal surgeries are the leading causes of surgical ARF in developed countries.

Improvements in obstetrical care have led to a virtual disappearance of ARF related to pregnancy in the advanced countries. Even in some of the developing countries like India, the incidence of obstetric ARF has shown a decline from 22% (of all ARF) in 1960s to 8% in 1990s [28] . On the other hand, in Ethiopia, septic abortion is the underlying cause of ARF in 52% of all patients [72] and in Argentina and Nigeria, gynecologic and obstetric complications still account for 32% and 25% of cases of ARF respectively [64,65] . This high incidence is due to the prevalence of unsafe home deliveries and abortions conducted by untrained personnel. The obstetric patients with severe ARF in the our study was 2 (1.8%) ; and they are increasingly rare elsewhere as well [16,73,74] However this may not be the true incidence in india as ours is a single centre and private set up where a limited number of patients would have been seen.

The patterns of ARF encountered in our study have, however, shown changes similar to those in the west, though at a much slower pace where the age of patients was old age with multiple comorbodities . Sepsis was the predominant cause of ARF and diarrhoea as cuse of severe ARF decreased and decline in obstetric causes and increasing surgical causes of ARF

Outcome

Acute renal failure continues to have a high mortality .Despite several decades of clinical experience with acute renal failure, the advent of newer antibiotics, vastly improved dialytic techniques, an impressive growth in the availability of vasoactive drugs and

aggressive nutritional support, the mortality rate of ARF has shown only a modest improvement over the last few decades.

Mortality varies according to the setting in which ARF developed. In NON ICU patients, the mortality is upto the tune of 40-50 %, whereas, it reaches upto 90% in the ICU setting [17,24.] In our study mortality in patients admitted in ICU was (87.8%) than patients admitted in non ICU (ward) (12.2%)

Analysis revealed increased age among the non-survivors but not statistically significant. Increasing age has been identified as an adverse prognostic factor in many studies. [25,21,39,32,76,77,78,79,80]. Presence of an increasing number of co-morbid conditions like diabetes, atherosclerosis with advancing age may contribute to the poor survival. However, some others demonstrated that patient's age does not worsen the outcome of ARF[17, 81, 82, 83].

Despite some previous studies which observed a trend towards an increasing number of ARF cases among male patients compared to female patients[75] and also showed male gender to be an effective factor on ARF mortality[76], in our study no significant difference was found between sex and ARF outcome

Among the causes leading to ATN sepsis was associated with poor outcome in previous studies[84,85,41,16,86,25,87,73,74] . Sepsis contributes to mortality by its associated cardiopulmonary failure. As has been well delineated in several other reports, this syndrome is associated with a poor prognosis; improved methods to treat multiorgan failure may benefit these patients.[88], [89] and traditional hemodialysis techniques have not helped to improve the outcome of ARF in such patients. In our study outcome of sepsis causing renal failure was not significant in univariate analysis however it was significant in multivariate analysis

Previous studies have examined cardiac morbidity as a prognostic factor, but results have been contradictory. Some have found an association with mortality[21, 31,81,84,90] whereas others have not[24, 41.] It is difficult to compare these studies because of a wide variation in the definition of "cardiac failure," including hypotension, CHF, infective endocarditis, myocarditis, arrhythmias, and myocardial infarction. At least three prior studies have found CHF specifically, rather than the broadly defined "cardiac failure," to be a risk factor for hospital mortality in ARF. Lien and Chan evaluated 58 patients retrospectively and found CHF, not specifically defined, to be associated with increased mortality by univariate (RR = 1.9), but not multivariate analysis [84.] Lohr, McFarlane, and Granthan retrospectively evaluated 126 patients with ARF and found CHF, defined as characteristic radiographic appearance, rales, decreased cardiac output, or the presence of a third heart sound, to have a significantly increased risk of mortality (RR = 1.3) [21]. In our study ATN due to cardiogenic shock secondary to acute myocardial infarction, acute decompensated cardiac failure was associated with poor outcome

In our study Hepatorenal syndrome as a cause of ARF was seen in 11 (9.6%) patients of which 9 patients (81.8%) died and was statistically significant .The BEST study [2] also demonstrated that hepatorenal syndrome was independent risk factors for hospital mortality. The pathology involved in the development of hepatorenal syndrome is thought to be an alteration in blood flow and vascular tone that supplies the splanchnic circulation and the kidneys[98]. The structure of the kidneys are basically normal, and the kidneys often function instantly well if the liver disease is corrected e.g. by liver transplantation. Hepatorenal syndrome carries a poor prognosis and is usually fatal[99].

In our study acute glomerulonephritis was seen in seven patients (6.1%) of which only one patient died and 4 patients developed ESRD. Presence of glomerular disease as a cause of ARF was associated with significantly better survival. The presence of other poor prognostic

factors like sepsis and organ system failures were less compared to the rest of the population. A better survival seen in patients with glomerular causes leading to ARF is in agreement with other studies [25].

Mortality rate was elevated among severe ARF patients due to snake bite who were treated with RRT (91). The recovery of ARF in snke bite is associated with shorter mean bite to needle time as was observed by Sharma et al [92], less bleeding manifestations as noticed by Soe et al [93] and intravascular hemolysis and elevated serum ceatinine as stated by Kalantri et al. [94] All of our patients treated with RRT expired though it is not the case in other studies where most patients of snake bite with severe renal failure. The high mortality in our study could be explained by probably being tertiary care centre only seriously ill snake bite patients would have been referred to us.

In our study 4 patients had acute pancreatitis of which 2 patients died. Presence of pancreatitis adversely affects the outcome by mortality and requires longer duration of RRT. This observation was in accordance with that of Rasmusseno et al [33]. Presence of lesser number of patients with the above illness may explain the statistically insignificant results obtained, in spite of high mortality

Patients with myoglobinuric renal failure and obstructive uropathy tended to have a better prognosis, but the small numbers of patients in such categories made it impossible to assign statistical significance to this observation[95]

In our study diabete mellitus was present in 34 patients (29.8%) out of which 9 patients died (26.5%).Similar to the observations of many other studies [20,21,29,96] presence of diabetes mellitus was not significantly associated with increased mortality.

Of 114 patients, 10(8.8%) had pre-existing chronic renal disease. After evaluating the effect of underlying CRD on the outcome of ARF, it is revealed that there is no statistically-significant relationship between prognosis of ARF and pre-existing CRD as a risk factor. A recent study determined underlying renal pathology as a leading precipitating cause for renal failure[97].

Presence of hypotension at the time of admission was associated with a poor outcome. This is in agreement with the results of other studies, where presence of hypotension was significantly associated with mortality [21, 29, 96] . Hypotension when present is usually associated with sepsis and multiorgan dysfunction syndrome thereby explaining the poor prognosis.

Oliguria has been associated with poor survival in many studies [16, 33, 41,29,37,42]. Our results were also similar, in that oliguric ARF had higher mortality than non-oliguric ARF (50.5 % vs. 0%, $P<0.05$). In our study 49.5% of the patients with oliguria survived and 100% of nonoliguric patients survived. Corwin et al [41]observed a survival of 83% among those with non oliguric ARF as compared to 42% of oliguric patients. Liano et al [29] noted that 65% of oliguric patients died against a mortality of 42% among non-oliguric patients.

Prognosis of patients who developed organ system dysfunction at the time of initiation of hemodialysis was compared to those who did not develop the same. Non-survivors presented with more organ system dysfunction at the time of initiation of hemodialysis than survivors.

In agreement with other studies, CVS dysfunction at the time of ARF was associated with a high mortality rate [33, 25,36,38,32].

Presence of hepatic failure at the time of initiation of haemodialysis was associated with increased mortality in a few series [84,100], but not in others [21, 32, 39]. In our study presence of liver failure at the time of initiation of haemodialysis was associated with significant mortality

Patients who present with CNS dysfunction at the time of initiation of haemodialysis have been observed to have a poor outcome in some studies [33,29,84.] Univariate analysis revealed that the patients who had CNS dysfunction were more prone to death

Presence of RS dysfunction and requirement of mechanical ventilation have been consistently associated with high mortality [2, 6,25,29,32,33,39,84,101]. Several mechanisms were hypothesized to explain this finding. First, mechanical ventilation might affect systemic haemodynamics through its effect on cardiac output. Second, mechanical ventilation could cause baro- and volutrauma, and generated release of systemic inflammatory mediators. Third, the need for mechanical ventilation was associated with conditions of greater severity, e.g. respiratory failure due to acute pulmonary edema or pneumonia

Metabolic acidosis was associated with poor outcome[2,4,19,61,102,103,104,105,106]. Our data suggest that the presence of metabolic acidosis increased the risk of mortality.

The mean serum creatinine at the time initiation of haemodialysis was significantly higher in the survivors group. Conflicting results are found in the literature regarding serum creatinine. A high serum creatinine among the survivors group may be explained by a selection bias. Probably, the patients with low serum creatinine were clinically more ill. Since dialysis is based on a clinical judgment rather than the absolute value of serum creatinine, a selection bias may explain the low serum creatinine among non-survivors.

The incidence of ESRD among patients who recovered was 6.1%. In a study done by Bonomini et al [107] observed ESRD in 16.2% of the survivors. Patients with acute glomerulonephritis especially those with rapidly progressive glomerulonephritis more often progressed to ESRD

SUMMARY AND CONCLUSION

SUMMARY AND CONCLUSION

One hundred and fourteen patients who were diagnosed to have ARF requiring haemodialysis during the study period and were analysed prospectively to (1) determine the variables predicting the outcome of acute renal failure (2) study the aetiology.

Medical causes contributed to ARF in 84.2%, surgical causes in 14% and obstetric causes in 2% of patients.

Among the causes of ARF, sepsis contributed predominantly (40.4%), followed by hypovolemic shock hepatorenal syndrome in 9.6% each.

Observations made on the analysis of the whole population

A mortality rate of 42.98% was noted in this study, another 53.5% patients recovered to normal renal function or mild renal dysfunction but not requiring hemodialysis during follow up, 3.5% patients survived but progressed to ESRD. Patients admitted in ICU had higher mortality.

Renal failure was oliguric in 85.1% and non oliguirc in 14.9%. Olguirc renal failure was associated with poorer outcome.

Results obtained on univariate analysis of the role of co existing diseases and organ system failures are as follows. The following factors were associated with hospital mortality by univariate analysis: history of chronic liver disease causes of ARF like cardiogenic shock, hepatorenal syndrome, use of vasopressors and mechanical ventilation, low urine output,serum creatinine , bilirubin, lactate, platelet count at the time of initiation of haemodialysis.

Multivariate analysis was performed and parameters directly related to ARF and found significant association with mortality were chronic liver disease, preexisting heart

disease, requirement of mechanical ventilation, oliguria, sepsis, hepatorenal syndrome cardiogenic shock, admission in ICU.

ARF leading to ESRD

1. Among the survivors, 3.5% progressed to ESRD.
2. Among the causes leading to ARF, patients diagnosed to have acute glomerulonephritis and were more likely to develop ESRD.
3. No other parameters, including gender, age, oliguria, , co-existing diseases, and organ dysfunction prior to the development of ARF , predicted progression to ESRD.

Limitation

As this was an observational study, drawing cause-andeffect conclusion between various factors and the outcomes was difficult. Also, it was only a single-centre study; the result may not be generalizable as different centres could have different causes and approaches in the management of ARF. In this study we did not separate the patients with severe ARF into hospital acquired or community acquired.

Conclusion

Our study showed that ARF patients requiring RRT was associated with high hospital mortality, Multivariate analysis was performed Parameters directly related to ARF and found significant association with mortality were chronic liver disease, preexisting heart disease, requirement of mechanical ventilation, oliguria, sepsis, hepatorenal syndrome cardiogenic shock, admission in ICU.Most survivors were free from dialysis at hospital discharge.

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APPENDICES

PROFORMA FOR ACUTE RENAL FAILURE

S. No:	**Cr No:**	**Admission no:**
Name:		**OP.NO:**
D.O. Admn:	**D. O. Disch:**	**D.O.Death:**
Ward on Admission	**Unit :**	**AMA**

Diagnosis	
Cause of Renal failure	

RISK FACTORS, On admission		**LABORATORY DATA / ON ADMISSION**	
Demographics		Hb	
Age		TC, N	
Male/ Female gender		Platelets	
Comorbidity / Duration		RBS/FBS/PPBS	
Diabetes Mellitus		Urea/ Creatinine	
Hypertension		Sodium/ Potassium	
Liver disease		Ionised Calcium	
Pre-existing heart disease		Metabolic acidosis –PH,	
Pre existing chronic renal disease			
		Lactate	

		High bilirubin	
Diagnosis			
Sepsis / Septic shock Source			
Medical Patients		**TREATMENT**	
Surgical Patients		Mechanical ventilation	
Obstetric Patients		Vasoactive medication	
ORGAN FAILURE			
Oliguria		Pulse	
Hypotension requiring ionotrops		BP	
GCS score		RR	
Respiratory Failure		Temperature	
Heart failure			
Liver failure			
Number of organ failure			

Severity of renal injury		**Treatment**	
Oliguria - Duration before initiation of dialysis		Site of catheter	
		Starting of HD (Date	
Creatinine level At the time of initiation of dialysis		Stopping of HD (date)	
		Total duration of HD	
		Date of recovery of renal failure	

Urine: Albumin PCR RBC WBC Bacteria

Immunological ANA: ANCA: ANTI GBM:

Miscellaneous:

Renal Biopsy

Date									
Urea									
Creatinine									

S NO	HOSP NO	NAME	AGE	SEX	WARD	LIVER DISEASE	HEART DISEASE	DIABETES	HYPERTENSION	RENAL FAILURE	Hb	TLC	PLATELET COUNT	SODIUM	POTASSIUI	PH	LACTATE	MECH VENTILATION	VASOACTIVE DRUGS	SYST BP<90	CREATININE
1	10/48558	RAJ KUMAR	50	Male	ICU	Absent	Present	Present	Absent	Present	13.8	10500	168000	136	4.3	7.34	0.8	Absent	Absent	Absent	2.8
2	10/48997	MOHAMMED	38	Male	Not ICU	Absent	Absent	Absent	Absent	Absent	12.9	10900	242000	137	4.5	7.3	2	Absent	Absent	Absent	6
3	10/49461	SHANMUGAM	50	Male	Not ICU	Absent	Absent	Absent	Absent	Absent	12.3	20000	145000	127	4.7	7.2	6	Absent	Absent	Absent	3.1
4	10/40081	MEENAKSHI	70	Female	ICU	Absent	Absent	Present	Present	Present	13.3	18900	332000	132	4.9	7.34	2	Absent	Absent	Absent	5.2
4	10/50351	VEERAPPA GOUNDER	75	Male	ICU	Absent	Absent	Absent	Absent	Absent	10.5	15100	119000	132	5.8	7.3	2.8	Absent	Present	Present	5
6	10/51345	NACHAMMA	81	Female	ICU	Absent	Absent	Absent	Absent	Absent	8.2	8400	425000	133	5.6	7.34	1	Absent	Absent	Absent	10
7	10/51492	SHANMUGAM	45	Male	ICU	Absent	Absent	Present	Present	Absent	11	6200	184000	137	3.9	7.4	0.8	Absent	Absent	Absent	5
8	10/52082	MUTHULAXMI	55	Female	ICU	Absent	Absent	Absent	Absent	Absent	9.7	9400	351000	141	3.1	7.3	0.8	Absent	Absent	Absent	8.1
9	10/51580	REHNA BEGUM	57	Female	ICU	Absent	Absent	Absent	Absent	Absent	14.5	17500	265000	135	3.9	7.2	2	Present	Present	Present	3.2
10	10/52583	VARADAMBAL	54	Female	ICU	Absent	Absent	Absent	Absent	Absent	6.1	18600	152000	133	6.8	7.2	2.1	Present	Present	Present	8.6
11	10/52260	CHELLAMUTHU	42	Male	ICU	Absent	Absent	Absent	Absent	Absent	10.2	20000	52000	138	3.6	7.2	6	Present	Present	Present	4
12	10/52593	KANAGARAJ	37	Male	Not ICU	Absent	Absent	Absent	Absent	Present	12.6	9600	332000	138	6.2	7.34	0.8	Absent	Absent	Absent	15
13	10/52610	PARVATHY	37	Female	ICU	Absent	Absent	Absent	Absent	Absent	17	29800	178000	138	4.9	7.2	12	Present	Present	Present	3.6
14	10/52000	PALANISAMY	61	Male	Not ICU	Absent	Absent	Present	Absent	Absent	11	10000	106000	133	4.4	7.24	4	Absent	Absent	Absent	5.4
15	11/00892	KUPPATHAL	71	Female	ICU	Absent	Absent	Present	Present	Present	11	16600	409000	142	2.2	7.1	0.7	Absent	Present	Present	5.1
16	11/02566	CHALLATHAL	65	Female	ICU	Absent	Absent	Present	Present	Present	10.4	10400	320000	122	8	7.4	1.2	Absent	Absent	Absent	2.07
17	11/05180	RAJALAXMI	55	Female	Not ICU	Absent	Absent	Present	Absent	Absent	8.4	21500	136000	126	5	7.4	0.8	Absent	Present	Present	5.4
18	11/02762	MUTHUSAMY	30	Male	ICU	Absent	Absent	Absent	Absent	Absent	13.5	14700	179000	133	3.3	7.3	0.8	Absent	Absent	Absent	8.9
19	11/00358	KRISHNAMMAL	77	Female	ICU	Absent	Present	Present	Present	Absent	10.2	20700	361000	136	5.5	7.1	10	Present	Present	Present	2.7
20	10/51492	SHANMUGAM	45	Male	ICU	Absent	Absent	Present	Present	Absent	11	6200	184000	137	3.9	7.4	0.8	Absent	Absent	Absent	5.9
21	10/49996	AYYAMMAL	65	Female	ICU	Absent	Absent	Present	Absent	Present	6.2	18000	93000	135	4.8	7.34	2.5	Absent	Absent	Absent	4.8
22	10/50148	GOPINATHAN	71	Male	ICU	Absent	Present	Present	Absent	Absent	10.6	13500	160000	135	4.5	7.1	5.6	Absent	Present	Present	4.5
23	10/50378	CHENNIYAPPA GOUN	70	Male	Not ICU	Absent	Absent	Absent	Absent	Absent	9.5	15700	88000	140	4.2	7.3	2	Absent	Absent	Absent	11.8
24	11/04316	SUSHEELA	42	Female	ICU	Absent	Absent	Absent	Absent	Absent	13.9	19200	235000	140	3.7	7.2	4	Absent	Absent	Absent	4.3
25	11/04830	GNANASEKAR	28	Male	ICU	Absent	Absent	Absent	Absent	Absent	12	16800	140000	138	6.6	7.2	2	Present	Absent	Absent	9.3
26	11/04199	KEMBIYAN	70	Male	ICU	Absent	Absent	Absent	Present	Absent	11.9	19200	290000	131	3.9	7.3	1.7	Absent	Absent	Absent	3.9
27	11/05126	PARIMALA	43	Female	ICU	Absent	Absent	Absent	Absent	Absent	8.8	17700	159000	130	7.1	7.34	0.8	Present	Absent	Absent	7.2
28	11/03145	PAUL RAJ	61	Female	Not ICU	Absent	Absent	Absent	Absent	Absent	9.6	29300	300000	129	3.6	7.2	4	Absent	Absent	Absent	3.7
29	11/03788	SARASWATHI	64	Female	ICU	Absent	Absent	Absent	Absent	Absent	8.8	13500	307000	131	6.5	7.34	1	Absent	Absent	Absent	4.5
30	11/10025	SUBRAMANI	47	Male	Not ICU	Absent	Absent	Absent	Present	Absent	11.4	14800	413000	132	3.7	7.34	0.8	Absent	Absent	Absent	14.9
31	11/09969	SARASATHAL	54	Female	ICU	Absent	Absent	Present	Absent	Present	15.9	21000	419000	149	4.7	7.06	4.2	Absent	Present	Present	4.3
32	11/09661	GNANASEKARAN	29	Male	ICU	Absent	Absent	Absent	Absent	Absent	11.1	18300	518000	130	5.8	7.3	7.5	Present	Present	Present	4.2
33	11/09458	FALLIA	41	Female	ICU	Absent	Absent	Present	Absent	Absent	7.1	14700	300000	138	4.3	7.3	3.3	Absent	Absent	Absent	7.3
34	11/08748	SUBASH CHANDRA BO	36	Male	ICU	Absent	Absent	Absent	Absent	Absent	10.8	20500	640000	130	4.1	7.34	2	Absent	Present	Present	4.9
35	11/08712	GANGAMMAL	60	Female	ICU	Absent	Absent	Absent	Absent	Absent	13.4	26000	577000	140	3.3	7.1	2.3	Present	Present	Present	4.7
36	11/08685	LEENUS	56	Male	Not ICU	Absent	Absent	Present	Absent	Present	12.4	12500	29000	131	3.1	7.2	4.2	Present	Present	Present	5.8
37	11/08398	VENUGOPAL	62	Male	ICU	Absent	Absent	Absent	Absent	Absent	10.1	21300	157000	138	3.1	7.4	5.2	Absent	Present	Present	3.2
38	11/06729	RAMYA	24	Female	ICU	Absent	Absent	Absent	Absent	Absent	11	36300	119000	136	3.6	7.1	5	Present	Present	Present	3.08
39	11/06713	HARISH	18	Male	Not ICU	Absent	Absent	Absent	Absent	Absent	10.9	9900	130000	143	4.8	7.34	0.8	Absent	Absent	Absent	3.3
40	11/05416	MANONMANI	57	Female	Not ICU	Absent	Absent	Absent	Present	Absent	11.4	18100	167000	121	4.8	7.34	1.9	Absent	Absent	Absent	5.4
41	11/05841	VENUGOPAL	56	Male	Not ICU	Absent	Absent	Present	Absent	Absent	10.4	16200	268000	134	7	7.24	0.8	Absent	Absent	Absent	8.3
42	11/08206	JOSEPH	82	Male	Not ICU	Absent	Present	Present	Present	Present	10.8	27900	112000	116	4.8	7.24	2.4	Absent	Absent	Absent	4.8
43	11/07188	PARAMASIVAM	47	Male	ICU	Absent	Present	Absent	Present	Absent	10.9	13200	276000	130	4.8	7.3	1.3	Absent	Absent	Absent	7.8
44	11/06990	CHINNASAMY	43	Male	Not ICU	Absent	Absent	Absent	Absent	Absent	9.1	22600	46000	136	6.6	7.34	1.2	Absent	Absent	Absent	10.9
45	11/06902	VENKATALAXMI	74	Female	ICU	Absent	Absent	Absent	Absent	Absent	12.7	6500	72000	132	3.4	7.4	2.4	Present	Present	Present	1.8
46	11/11713	JACOB	34	Male	ICU	Absent	Absent	Absent	Present	Absent	9.8	9400	232000	126	5.8	7.3	0.6	Absent	Absent	Absent	7.9
47	11/11496	SIVAKUMAR	37	Male	ICU	Absent	Absent	Absent	Absent	Absent	14.5	10400	147000	122	3.5	7.1	9	Present	Present	Present	14
48	11/11245	RESHMA	38	Male	ICU	Absent	Absent	Absent	Absent	Absent	10.4	37000	130000	130	4.7	7.34	4.6	Present	Present	Present	3.5
49	11/11824	KAUSHIK	19	Male	ICU	Absent	Absent	Absent	Absent	Absent	12.3	9800	397000	146	5.1	7.2	2.8	Present	Present	Present	4.5
50	11/11729	YOGINI	68	Female	Not ICU	Absent	Absent	Absent	Absent	Absent	12.9	17300	240000	140	3.9	7.1	10	Present	Present	Present	3.4
51	11/12698	RAJAMANI	74	Male	ICU	Absent	Present	Present	Absent	Absent	10.8	15800	333000	128	4.6	7.3	2.3	Present	Present	Present	1.6
52	11/12257	SARAVANA KUMAR	32	Male	ICU	Absent	Absent	Absent	Absent	Absent	19.6	15300	44000	140	5.6	7.2	4.7	Present	Present	Present	3.5
53	11/13069	DAKSHAYANI	60	Female	ICU	Absent	Absent	Absent	Absent	Absent	14	24100	301000	141	3.3	7.1	4.2	Absent	Absent	Absent	4.6
54	11/13965	SEKHAR	53	Male	Not ICU	Absent	Absent	Absent	Absent	Absent	13.4	15600	244000	133	3.4	7.3	0.8	Absent	Absent	Absent	7.9

55	11/14917	KANNIKIDEVI	45	Female	ICU	Absent	Absent	Present	Absent	Present	13.1	19800	142000	160	4.3	7.3	2.5	Absent	Absent	Absent	3.8
56	11/14516	DAMODARAN	76	Male	Not ICU	Absent	Absent	Absent	Absent	Absent	10.7	24400	229000	138	5.4	7.4	2.6	Absent	Absent	Absent	4.9
57	11/15501	GOVINDAN	43	Male	Not ICU	Absent	Absent	Present	Present	Absent	10.8	12500	150000	135	4.8	7.3	0.8	Absent	Absent	Absent	6.08
58	11/11175	RAYAPPAN	72	Male	ICU	Absent	Absent	Present	Absent	Absent	9.9	22300	73000	155	4.4	7.2	9.5	Present	Present	Present	3.6
59	11/07866	ARMUGAM	65	Male	Not ICU	Absent	Absent	Absent	Absent	Absent	5.9	20000	129000	132	4.4	7.3	3.6	Present	Absent	Absent	10.6
60	11/16766	PERIYASAMY	56	Male	ICU	Absent	Absent	Absent	Present	Absent	11.4	11200	132000	128	4.1	7.34	0.8	Absent	Absent	Absent	6.7
61	11/16769	SAYAMMAL	80	Female	ICU	Absent	Absent	Absent	Absent	Absent	8.8	14900	12000	135	4.1	7.3	0.8	Absent	Present	Present	4.7
62	11/16537	SIVARAJ	28	Male	ICU	Absent	Present	Absent	Absent	Absent	11.7	19100	102000	138	2.7	7.1	15	Absent	Present	Present	3.9
63	11/17188	KOMALA DEVI	43	Female	Not ICU	Absent	Absent	Absent	Absent	Absent	6.6	18100	225000	138	3.8	7.3	3	Absent	Absent	Absent	5.8
64	11/18200	MALLIKA JAN	54	Female	Not ICU	Absent	Absent	Present	Absent	Absent	5.4	13600	420000	130	7.2	7.2	4	Absent	Absent	Absent	6.3
65	11/18749	KRISHNAVENI	54	Female	ICU	Absent	Absent	Absent	Absent	Absent	11.2	16000	54000	138	4.1	7.3	2.4	Present	Present	Present	3.2
66	11/12855	DURAISAMY	59	Male	ICU	Present	Absent	Absent	Absent	Absent	6.1	13600	60000	130	7.5	7.1	6	Absent	Present	Present	5.8
67	11/07928	PRAKASH	23	Male	ICU	Present	Absent	Absent	Absent	Absent	11	12300	32000	132	6.1	7	12	Present	Present	Present	2.9
68	11/01127	CHANDRASEKAR	45	Male	ICU	Present	Absent	Absent	Absent	Absent	9.3	27500	263000	131	4.7	7.1	8	Present	Present	Present	3.7
69	11/10222	DEVARAJ	60	Male	ICU	Present	Absent	Absent	Absent	Absent	14.6	18100	251000	116	4.8	7.4	1.8	Present	Present	Present	3.9
70	11/12210	KANNAMMAL	76	Female	ICU	Absent	Absent	Absent	Present	Absent	8.6	26000	86000	134	8.2	7.4	2.6	Present	Present	Present	2.04
71	11/13659	BALASUBRAMANYAM	62	Male	ICU	Present	Absent	Absent	Absent	Absent	10.8	23400	116000	130	4.3	7.4	3.5	Present	Present	Present	5.3
72	11/11107	RAMASAMY	39	Male	ICU	Present	Absent	Absent	Absent	Absent	10.6	16000	110000	122	5.7	7.2	11	Absent	Present	Present	2.9
73	11/13156	SIVAM	68	Male	ICU	Absent	Absent	Absent	Absent	Absent	13	19800	147000	145	3.6	7	3	Present	Present	Present	4.1
74	11/19517	SUNEEL	41	Male	ICU	Present	Absent	Absent	Absent	Absent	12.9	12600	150000	137	3.6	7.3	3.3	Present	Absent	Absent	3.8
75	11/19989	NABEESHA	56	Female	Not ICU	Absent	Absent	Present	Absent	Absent	10.5	13000	351000	134	4.9	7.3	0.8	Absent	Absent	Absent	5.6
76	11/20075	RAMASAMY	68	Male	ICU	Absent	Absent	Absent	Absent	Absent	10.7	20000	150000	124	8.8	7.2	1.2	Present	Absent	Absent	12.5
77	11/20443	RUKMINI	64	Female	Not ICU	Absent	Absent	Present	Absent	Absent	11.9	11800	250000	127	3.6	7.3	0.8	Absent	Absent	Absent	7.6
78	11/18253	VENKATESH	40	Male	ICU	Present	Absent	Absent	Present	Absent	8.3	5400	69000	140	4.2	7.3	0.8	Absent	Absent	Absent	3.8
79	11/12845	BAGYALAXMI	37	Female	ICU	Absent	Absent	Absent	Absent	Absent	11.2	24200	124000	134	4.5	7.1	19	Present	Present	Present	3.5
80	11/07710	RANI KUMAR	47	Male	ICU	Present	Absent	Present	Absent	Absent	13.3	52000	23000	134	3.6	7.2	19	Present	Present	Present	2.7
81	11/05404	MAHENDRAN	43	Male	ICU	Absent	Absent	Present	Absent	Absent	9	10900	309000	129	4.6	6.8	16	Present	Present	Present	9.1
82	11/03185	MARIYAMMAL	45	Female	ICU	Absent	Present	Absent	Absent	Absent	12.6	10300	195000	134	4.2	7	11	Present	Present	Present	4.2
83	11/03127	BASHEER AHMED	77	Male	ICU	Absent	Absent	Absent	Absent	Absent	15	35000	221000	132	5	7.4	2.5	Present	Present	Present	8.7
84	11/01108	GANGUSAMY	89	Male	ICU	Absent	Present	Absent	Present	Absent	14.4	8900	199000	135	4.5	7.3	3.3	Present	Present	Present	2.7
85	11/01238	SUBRAM AN	51	Male	ICU	Present	Absent	Absent	Absent	Absent	11	18000	82000	137	4.1	7.2	5.6	Present	Present	Present	2.4
86	11/01116	BANUMATHI	81	Female	ICU	Absent	Absent	Absent	Absent	Absent	13.9	10500	267000	130	3.9	7.3	1.7	Present	Present	Present	2.9
87	11/03372	NATHESH	67	Male	Not ICU	Absent	Present	Absent	Present	Absent	10.3	7200	138000	120	4.7	7.3	2.5	Absent	Absent	Absent	7.1
88	11/01467	MANIVASAGAM	51	Male	ICU	Absent	Absent	Absent	Absent	Absent	16	20800	84000	134	4.8	7.1	11	Absent	Present	Present	4.9
89	11/15989	PARVATHINADAN	62	Male	ICU	Absent	Present	Present	Present	Absent	12.9	11500	81000	121	4.8	7.3	7.3	Absent	Absent	Absent	3.6
90	11/15847	MESHAM	65	Male	ICU	Absent	Absent	Present	Absent	Absent	7.6	22000	355000	116	5.9	7.3	3	Absent	Present	Present	5
91	11/01389	EBENRAJ	57	Male	ICU	Absent	Absent	Absent	Absent	Absent	10	19100	120000	130	5.9	7.2	12	Present	Present	Present	5
92	11/16177	KANDASAMY	55	Male	ICU	Absent	Absent	Absent	Absent	Absent	10	15000	106000	132	5.3	7.2	10	Present	Present	Present	7
93	11/05032	USHA	28	Female	ICU	Absent	Absent	Absent	Absent	Absent	10.9	12900	100000	133	7.5	7.3	0.8	Absent	Absent	Absent	7.1
94	11/18357	RUKMINI	75	Female	ICU	Absent	Absent	Absent	Present	Absent	10.8	22000	60000	132	4.9	7.3	7.9	Absent	Present	Present	2.8
95	11/17378	AMALRAJ	46	Male	ICU	Absent	Absent	Absent	Absent	Absent	16	15600	185000	141	3.6	7.2	2	Present	Present	Present	8.5
96	11/05693	ARMUGAM	50	Male	ICU	Absent	Present	Absent	Absent	Absent	10.9	4800	233000	127	5.2	7.3	10	Absent	Present	Present	4.5
97	11/00084	SRINIVASAN	55	Male	ICU	Absent	Absent	Present	Absent	Absent	12.3	16600	22000	140	3.1	7.1	6.4	Present	Present	Present	2.6
98	11/00144	SUBRAMANI	61	Male	ICU	Absent	Present	Present	Present	Absent	10.4	17000	225000	129	6.7	7	10	Present	Present	Present	12
99	10/52967	MARAGADAM	57	Female	Not ICU	Absent	Present	Present	Absent	Absent	9.6	9900	176000	125	2.5	7.4	0.8	Absent	Absent	Absent	2.7
100	11/01284	SIVARAJ	30	Male	Not ICU	Absent	Absent	Absent	Absent	Absent	17.5	25200	353000	133	4.7	7.24	2	Absent	Absent	Absent	5.3
101	11/01787	NALLASAMY	50	Male	Not ICU	Absent	Absent	Absent	Absent	Absent	10.4	29000	102000	121	7.1	7.4	0.8	Absent	Absent	Absent	6.2
102	11/01836	SRISOUNDARYA	24	Female	ICU	Absent	Absent	Absent	Absent	Absent	10.2	83000	83000	135	3.5	7.07	16.5	Present	Present	Present	3.2
103	11/01470	SELVI	54	Female	ICU	Absent	Absent	Absent	Absent	Absent	8.2	12900	139000	121	4.1	7.3	0.8	Absent	Absent	Absent	5.1
104	11/01478	VETRIVEL	49	Male	ICU	Absent	Absent	Present	Absent	Absent	10	23000	50000	132	6.01	7.4	2.8	Absent	Present	Present	5.2
105	11/01046	JOHN BERNABAS	58	Male	ICU	Absent	Absent	Present	Absent	Absent	16	14900	216000	135	4.6	7.24	0.8	Absent	Present	Present	6.5
106	11/01058	VENKATACHALAM	38	Male	ICU	Absent	Absent	Absent	Absent	Absent	12	38500	59000	132	3.5	7.3	6.3	Present	Present	Present	3.2
107	11/01876	KRISHNAN	71	Male	ICU	Absent	Present	Absent	Absent	Absent	10.1	9900	190000	127	8.2	7.4	0.8	Absent	Present	Present	3.5
108	11/00358	KRISHNAMMAL	77	Female	Not ICU	Absent	Absent	Present	Absent	Absent	10.2	15700	361000	136	4.6	7.4	0.8	Absent	Present	Present	2.6
109	11/02074	RAJALAXMI	55	Female	ICU	Absent	Absent	Absent	Absent	Absent	10.3	3600	28000	135	5	7.3	2	Absent	Absent	Absent	5.3
110	11/02803	INDRANI	26	Female	ICU	Absent	Absent	Absent	Absent	Absent	10.4	32600	153000	138	4.1	7.2	9.8	Absent	Absent	Absent	3.9
111	11/02857	SIVA	42	Male	Not ICU	Present	Absent	Absent	Absent	Absent	9.9	22500	115000	108	7.1	7.2	10	Absent	Absent	Absent	2.4
112	11/02785	RAMMURTHY	40	Male	ICU	Absent	Absent	Present	Absent	Absent	14.7	14400	62000	128	6.7	7.3	2.5	Absent	Absent	Absent	2.4
113	11/03266	KANDASAMY	43	Male	Not ICU	Absent	Absent	Absent	Absent	Absent	10.3	9000	250000	133	3.1	7.4	0.8	Absent	Absent	Absent	6.8
114	11/03048	PALANYSAMY	54	Male	ICU	Absent	Present	Absent	Absent	Absent	15.8	5100	182000	112	7.2	7.3	3	Absent	Present	Present	2

BILIRUBIN	GCS	URINE OUTPUT	SPECIALITY	Sepsis	HYPOVOLEMIC SHOCK	Hepatorenal Syndrome	CARDIOGENIC SHOCK	Acute glomerular disease	Drugs	Obstruction	Post CABG	Snake bite	Following major surgery	Pancreatitis	Malaria	Pregnancy related	Rhabdomplysis	OUTCOME	DURATION OF HOSPITAL STAY(Days)	DURATION OF DIALYSIS (Days)
0.5	15	Present	Surgery	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	10	2
0.5	15	Absent	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	8	3
5	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	15	8
0.5	15	Absent	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	20	10
1.7	13	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	10	4
0.5	15	Absent	Medicine	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	15	8
0.5	15	Present	Medicine	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	ESRD	14	90
0.5	15	Absent	Medicine	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	12	4
4	12	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	14	4
0.3	10	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	3	2
2	10	Present	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Recovered	14	4
0.5	15	Present	Surgery	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	10	20
4.2	6	Present	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Non Survivors	4	2
4.5	15	Absent	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	16	14
0.5	15	Present	Medicine	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	9	5
0.5	15	Absent	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	5	2
0.5	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	20	40
0.5	15	Present	Surgery	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Recovered	30	60
0.5	10	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	4	2
0.5	15	Present	Medicine	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	ESRD	15	90
2.3	10	Present	Surgery	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	1Absent	Absent	Absent	Absent	Absent	Non Survivors	14	10
2.4	15	Present	Medicine	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	2	2
0.5	15	Absent	Surgery	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	15	10
0.5	15	Present	Medicine	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	5	10
1.7	12	Present	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Recovered	35	60
0.5	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	10	7
0.5	12	Present	Medicine	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	10	10
29	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	15	3
6.1	12	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	10	10
0.5	15	Absent	Surgery	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	10	5
2	12	Present	Medicine	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	10	20
0.7	15	Present	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Recovered	20	30
0.5	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	7	4
0.5	15	Present	Medicine	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	5	4
2	10	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	2	1
1.6	8	Present	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Recovered	11	10
1.2	12	Present	Surgery	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	7	10
4.7	12	Present	OBG	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	13	10
0.8	15	Present	Medicine	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	8	4
1.5	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	10	5
1.2	15	Present	Surgery	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	10	4
0.8	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	10	4
0.8	15	Absent	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	6	4
0.5	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	7	20
0.7	12	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	30	4
0.5	15	Present	Medicine	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	ESRD	7	90
0.5	8	Present	Medicine	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	9	9
3.9	8	Present	Surgery	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	1Absent	Absent	Absent	Absent	Absent	Non Survivors	4	2
2.3	10	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	6	4
2.4	8	Present	Surgery	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	1Absent	Absent	Absent	Absent	Absent	Non Survivors	20	12
0.5	15	Present	Surgery	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	16	6
3.1	10	Present	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Non Survivors	2	2
0.5	15	Present	Medicine	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	7	5
0.5	15	Present	Medicine	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	7	28

0.8	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	10	14
4.8	15	Absent	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	20	8
0.5	15	Present	Medicine	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	7	7
0.5	10	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	2	2
1.2	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	50	30
0.5	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	15	5
0.8	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	15	7
4	15	Present	Medicine	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	14	10
0.6	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	18	18
0.5	15	Absent	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	10	4
6.5	8	Present	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Recovered	9	9
6.2	8	Present	Medicine	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	2	2
23	8	Present	Medicine	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	2	2
30	5	Present	Medicine	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	4	3
32	8	Present	Medicine	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	14	2
1.6	10	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	15	5
8.5	12	Present	Medicine	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	23	23
19.5	10	Present	Medicine	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	18	10
0.9	12	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	17	10
4.8	15	Absent	Medicine	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	32	10
0.5	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	14	5
0.5	10	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	20	20
0.5	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	10	4
8	15	Present	Medicine	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	24	10
5.3	5	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	2	2
11.3	10	Present	Medicine	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	2	2
0.8	8	Present	Medicine	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	2	2
5	10	Present	Medicine	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	19	19
0.8	10	Present	Surgery	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	1Absent	Absent	Absent	Absent	Absent	Non Survivors	5	5
5	12	Present	Medicine	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	13	5
3.8	10	Present	Medicine	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	2	2
0.5	12	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	13	5
4	15	Present	Medicine	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	10	10
6.1	12	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	2	2
3.1	15	Present	Medicine	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	14	8
0.8	15	Present	Surgery	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	10	5
5	8	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	3	3
2	8	Present	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Non Survivors	13	13
0.8	15	Present	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Recovered	18	30
5.3	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	2	2
4.1	3	Present	Surgery	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	10	2
5	12	Present	Medicine	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	10	5
5.6	8	Present	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Non Survivors	22	22
0.8	6	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	24	24
4	15	Present	Medicine	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	30	10
0.5	15	Present	Medicine	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	12	20
3.4	15	Absent	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	10	7
3.7	8	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	10	10
0.5	15	Present	Medicine	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	ESRD	8	90
14.9	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	5	5
0.5	15	Present	Medicine	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	20	42
4.5	12	Present	Medicine	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Non Survivors	3	3
1.7	15	Present	Medicine	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	7	3
0.5	15	Absent	Surgery	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	30	20
4.7	15	Present	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	9	9
13	15	Absent	OBG	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Recovered	23	30
9.2	12	Present	Medicine	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	10	10
0.5	15	Absent	Medicine	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	22	15
0.5	15	Absent	Surgery	Absent	Absent	Absent	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Recovered	9	3
4.5	10	Present	Medicine	Absent	Absent	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Non Survivors	2	2

A STUDY OF FACTORS DETERMINING OUTCOME OF ACUTE RENAL FAILURE PATIENTS REQUIRING HEMODIALYSIS

ABSTRACT:

Background: Acute renal failure is a common problem in critically ill patients and usually associated with significant morbidity and a high mortality rate. Despite advances in the management of critically ill patients with acute kidney injury (AKI), the prognosis is poor.

Aim*:* To ascertain the causes and outcomes of acute renal failure requiring renal replacement therapy.

Design: A prospective observational study of patients with acute renal failure treated with IHD in one teaching tertiary care hospital from November 2010 to 31 Oct 2011 .The outcomes measured was hospital mortality and progression to ESRD and dialysis dependency Relationship between demographics, premorbidities and clinical parameters with outcome was studied.

Measurements and results: One hundred and fourteen patients were included in the final analysis. Of the 114 patients, 49 died (42.98%), 61 (53.5%) recovered to have normal renal function or mild renal dysfunction and 4 patients (3.5%) progressed to end state renal disease (ESRD) The Mortality among patients admitted in ICU was 87.8%. Parameters directly related to ARF and found significant association with mortality by multivariate analysis were chronic

liver disease, preexisting heart disease, requirement of mechanical ventilation, oliguria, sepsis, hepatorenal syndrome cardiogenic shock, admission in ICU.

Conclusion: ARF in ICU was associated with a high mortality rate. Patients with poor outcome were presence of chronic liver disease, preexisting heart disease hepatorenal syndrome and mechanical ventilation cardiogenic shock,. Most of the hospital survivors were free from dialysis.

Key words: Acute renal failure, Intermittent haemodialysis, Outcome predictors